# MARINE REVIEW.

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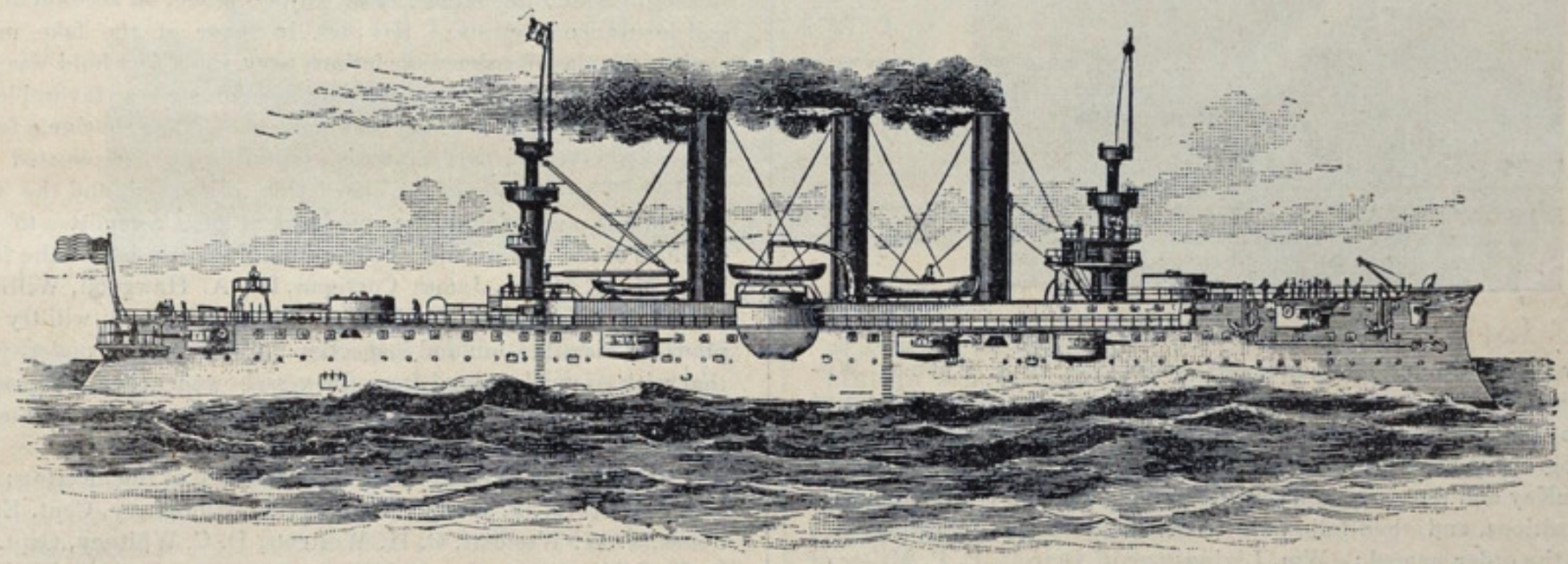
## United States Armored Cruiser Brooklyn.

At the first session of the present congress in July last appropriations were provided for two war vessels, one an armored cruiser of about 8,000 tons displacement, and the other a battle ship. Proposals for the construction of these vessels were opened a short time ago, and although the contracts have not as yet been awarded, it is very probable that they will be built by the William Cramp & Sons' Ship and Engine Building Company, Philadelphia, as the bids of that firm, $2,986,000 for the armored cruiser and $3,110,000 for the battle ship, were the lowest presented to the navy department.

The armored cruiser, for which congress placed the limit of cost at $3,500,000 exclusive of armament and speed premiums, will be known as the Brooklyn. The principal dimensions of this vessel are as follows:

| | |
|---|---|
| Length on load line | 400.50 feet. |
| Beam, extreme | 64.83 feet. |
| Draft, mean, normal | 24.00 feet. |
| Displacement, normal | 9,150.00 tons. |
| Displacement, trial | 8,150.00 tons. |
| Indicated horse power | 16,000.00 |
| Speed in knots per hour | 20.00 |
| Total coal capacity | 1,650.00 tons. |
| Coal carried on normal displacement | 900.00 tons. |



UNITED STATES CRUISER BROOKLYN.

The Brooklyn will have twin screws, the engines to be of the vertical, triple-expansion type, four in number, two on each shaft, and in four compartments. The forward engines to be readily uncoupled from the after engines for cruising at low speed. The boilers are placed in three compartments and are seven in number, five of them being double-ended and two single-ended. The hull is to be of steel, not sheathed, with double bottom and close water-tight subdivision to about 12 feet above the water line. The arrangement of decks above water to provide ample freeboard and berthing accommodations. It is contemplated to fit two military masts with fighting tops to carry no sail. The boats will be stowed clear of the blast of the guns, but two life boats must be so carried that they may be readily lowered under all conditions of weather.

Protection of the hull is to be afforded by means of a steel protective deck worked from stem to stern and supported by heavy beams. The bottom edges of this deck, amidships, are to be 5 feet 6 inches below the 24-foot water line, the top of the deck rising to this water line at the center of the vessel. On the slopes of the deck, over machinery and boilers, the armor is to be six inches thick; on the horizontal portions the armor is to be 3 inches thick. Forward and abaft the machinery and boilers, to stem and to stern, the deck is to be at the thinnest part at least 2½ inches in thickness. Below the deck are to be placed the propelling machinery, steering gear, magazines, shell rooms and all that is ordinarily styled "the vitals of a warship."

Protection of the hull from injury to the water line region is to be afforded by means of an armor belt 3 inches in thickness extending the length of the machinery and boiler space, and in depth from 4 feet above the 24-foot water line to 4 feet 3 inches below that line. Within this armor belt and skin plating, and above the armor of this belt, a band about 3½ feet wide of cellulose is to extend the whole length of the vessel, in depth from the armor deck to the berth deck. It is intended to carry coal above the armor deck for a length corresponding to the inner bottom. This space between the armor deck and the deck above is to be subdivided by water-tight bulkheads into at least 36 coal bunkers, exclusive of the coffer dam and passages. The space forward and abaft these bunkers is to be well subdivided by water-tight bulkheads for stores, etc.

A conning tower of not less than 7½ inches in thickness to be carried in a suitable commanding position, having a tube to the protective deck of not less than 5 inches in thickness for the protection of speaking tubes, bell wires, etc.

The battery of the vessel is to be: Eight 8-inch B. L. R. of 35 calibers; twelve 5-inch, B. L. R. rapid-fire guns; twelve 6-pounder rapid firing guns; four 1-pounder rapid-fire guns; four machine guns and 2 field guns. The torpedo outfit is to consist of five torpedo tubes, one in the bow and two on each side, six torpedoes and a suitable allowance of gun-cotton for mines and miscellaneous purposes.

Provision is to be made for defense against torpedo attacks by means of steel ring nets carried by out-rigger booms.

There is an electric lighting plant consisting of two divisions, each division having an engine and dynamo, and each dynamo having a rated output of 400 amperes at 80 volts.

The ship will have a radius of action at full speed of 1,792 knots, and a radius of action at 10 knots of 6,216 knots.

The complement of officers and men will be 566 persons. The hull and fittings were designed by the bureau of construction and repair, under the direction of Chief Constructor T. D. Wilson, U. S. N., and the machinery by the bureau of steam engineering, under the direction of Engineer-in-Chief George W. Melville.

The engraving is reproduced from the Iron Age.

## LEADERS IN LAKE SHIPPING MATTERS.

### A Most Successful Meeting of the Lake Carriers' Association.

Editorial Correspondence.

DETROIT, Mich., Jan. 12.—When the old Lake Carriers' Association was reorganized here last March, through the leaders in marine matters at Buffalo, Cleveland, Detroit and Chicago making a bold effort effort to combine in one general organization the several associations in the different cities, there were some fears of success in the undertaking, but the annual meeting here to-day is a grand tribute to the promoters of the big association, and an assuranec that the varied interests have not only been brought together on a most substantial basis of mutual protection, but the influence of the organization as now indicated will be greater than that of any similar body in the country. The gathering, as shown by the list of owners and managers in attendance, was the largest ever assembled on the lakes. It was truly a representative body of active men engaged in lake commerce.

In the routine connected with the election of officers and other detail, the most important feature was the warm endorsement tendered President M. A. Bradley and his associates, who have given up their time to the affairs of the association during the past year. Then, in accordance with the rule that no president shall hold office for more than one year, the association proceeded

CAPT. THOS. WILSON, PREST.

to elect a new president, and this honor was accorded to Capt. Thomas Wilson of Cleveland, who has seen more than a quarter of a century of active service on the lakes and has advanced to a position of wealth and influence through a progressive business policy. Secretary Chas. H. Keep, Treasurer George P. McKay and Attorney Harvey D. Goulder were re-elected to their respective positions, and then followed the selection of the following vice presidents in the order named: Wm. Livingstone of Detroit, P. P. Miller of Buffalo, John G. Keith of Chicago, Alexander McDougall of Superior, James Davidson of West Bay City, W. S. Brainard of Toledo, James Corrigan of Cleveland, F. J. Firth of Philadelphia. John Rice of Buffalo was elected to the position made vacant in the board of managers by the resignation of Capt. W. P. Henry, who has quit the lakes, and W. R. Owen of Chicago, Hon. W. J. White of Cleveland and M. M. Drake of Buffalo are three new members added to that body. Mr. Frank Owen of Ogdensburg, manager of the Ogdensburg Transit Company, takes the place of Mr. Baldwin of the same company on the board of managers and on the committee on legislation. This change is made on account of Mr. Baldwin turning over the management of the lake line to Mr. Owen upon being advanced to a higher position in the management of the Vermont Central Railway. Mr. Bradley will take Capt. Wilson's position on committees, and Mr. Rice of Buffaio will act in a like manner as regards the committeeship held by Capt. Henry.

A lengthy discussion resulted on the question of dues during the coming year, mainly on account of opposition from Capt. James Davidson to a 4-cent rate, as charged last year. The disposition of members was, however, overwhelmingly in favor of liberal dues, and the 4-cent rate stands.

On several occasions engineers going from the lakes to the Atlantic seaboard have been refused a license as chief engineer for salt water, on account of a ruling of the steamboat inspection service that bars an engineer from such work no matter how rigid an examination he may be ready to undergo. The association has resolved to take this matter up with the supervising inspectors at their annual meeting in Washington toward the close of the present month.

Commander Nicoll Ludlow, U. S. N., recently relieved from lighthouse duty on the lakes was honored by the adoption of resolutions highly commendatory of his services.

The joint report of Secretary Charles H. Keep and Treasurer George P. McKay, had been prepared in pamphlet form and this arrangement served to facilitate matters pertaining to the conduct of the meeting. It was estimated at the first meeting of the reorganized association a year ago that a tonnage of 550,000 tons could be secured. The expectations of the board of managers have been more than realized. The following is the summary of the tonnage of the association during the past year:

| | | | |
|---|---|---|---|
| Steamers, | No. 360. | Net registered tonnage, | 430,880. |
| Schooners, | No. 255. | " " " | 149,030. |
| Total vessels, | No. 615. | Total tonnage, | 579,919. |

Secretary Keep's report reviews the work that has led up to a reduction in the expense of private lights so that the cost now is a nominal figure. All legislative matters that have been discussed throughout the year are also summed up in concise form. The most important matter in this regard now is, of course, the question of raft towing. The policy of the association on the rafting subject is, as has been explained of late, to secure the appointment of a commission of engineer officers of the army to investigate the business, and the association finds at its annual meeting that work along this line has progressed so that the senate has already passed a resolution with that end in view and like action on the part of the house is expected shortly.

The aggregate of disbursements during the year was $25,114.10 and the balance on hand $270.20. Irrespective of these amounts the association has liabilities amounting to $1,236.66 and uncollected assets amounting to $1,721.35.

#### INSURANCE MATTERS.

David Vance of Milwaukee, C. A. MacDonald, J. S. Gadsden, Amasa Fitch and Mr. McCurdy of Chicago were here to push the matter of a re-organized Inland Lloyds. The ball was set to rolling at the meeting when a letter from William W. Bates was read, announcing that he was formulating rules for the American Shipmasters' Association. Mr. Bates' fame in load line matters will never be forgotten, and the lake underwriters scored a point against the classification association by the reading of the letter from Bates. Capt. Millen of Detroit immediately moved that the letter be laid upon the table for one year, and then David Vance of Milwaukee got in his work with a smooth speech in which he claimed to be on the fence, on account of his allied vessel and insurance interests. His plea in favor of the lake underwriters and against the classification associations securing a foot hold was successful, however, to the extent that the association expressed a favorable feeling toward the underwriters with whom they have been doing business for years past, but refused to take any part as an association in the complicated insurance difficulties. The meeting of the association adjourned, and the vessel owners as individuals proceeded to the appointment of a committee to take up the suggestions of the underwriters. The committee consists of the following: John Rice, M. M. Drake, James Corrigan, H. A. Hawgood, William Livingstone, Jr., M. L. Higgie and H. Coulby. These gentlemen will try to agree upon plans for classification and inspection. Some of the underwriters now claim that with so much gained from the vessel owners they will succeed in gaining the services of Capt. Herriman as an expert and formulate a new Inland Lloyds.

Following is a list of those in attendance at the meeting:

Detroit—H. S. Hodge, Capt. W. H. Humphrey, Cept. E. M. Peck, J. M. Jones, J. W. Westcott, C. H. Westcott, D. C. Whitney, Capt. Richard Cusen, C. P. Taylor, Capt. James Millen, Aaron A. Parker, W. S. Gray, John C. Shaw, E. C. Waldo, Capt. Mart. Swain, Waldo Avery, Chas. L. Wilson, Timothy Hurley, Gilbert N. McMillan, Charles Norton, Capt. Bernard Wilds, Byron Whitaker, Charles Whitaker, Henry Wineman, N. S. Whipple, David Carter, Capt. Eber Ward.

Cleveland—M. A. Bradley, Capt. Thomas Wilson, Capt. Wm. Mack; Joseph R. Oldham, W. C. Richardson, B. L. Pennington, Capt. John Mitchell, H. A. Hawgood, W. P. Murray, H. Coulby, Capt. George P. McKay, Capt. C. E. Benham, Hon. W. J. White, H. D. Goulder, Esq., James Corrigan, John Corrigan, Mart. Mullen.

Buffalo—J. J. H. Brown, C. H. Keep, M. M. Drake, P. P. Miller, C. H. Woodruff, James McKenzie, Ed. Smith, John Rice.

Chicago—J. S. Dunham, John G. Keith, D. T. Helm. J. L. Higgie, C. W. Elphicke, Capt. J. A. Calbick, Hugh McMillen.

Bay City—John Shaw, James Davidson.

Toledo, O.—W. S. Brainard, L S. Sullivan.

Port Huron, Mich.—Capt. A. R. Sinclair.

St. Clair, Mich.—Capt. Henry Fish.

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The Record of American and Foreign Shipping for 1893, published by the American Shipmasters' Association, New York, has been received. It is the twenty-fifth annual issue of the Record and it is the most complete register published in this country, containing the names of 18,000 vessels together with rules for construction of all classes of wooden, iron and steel vessels. The rules are endorsed by the United States navy department. Every shipbuilder should subscribe for it. The association is now engaged in classifying a number of lake vessels.

## Criticism on Lake Ship Building.

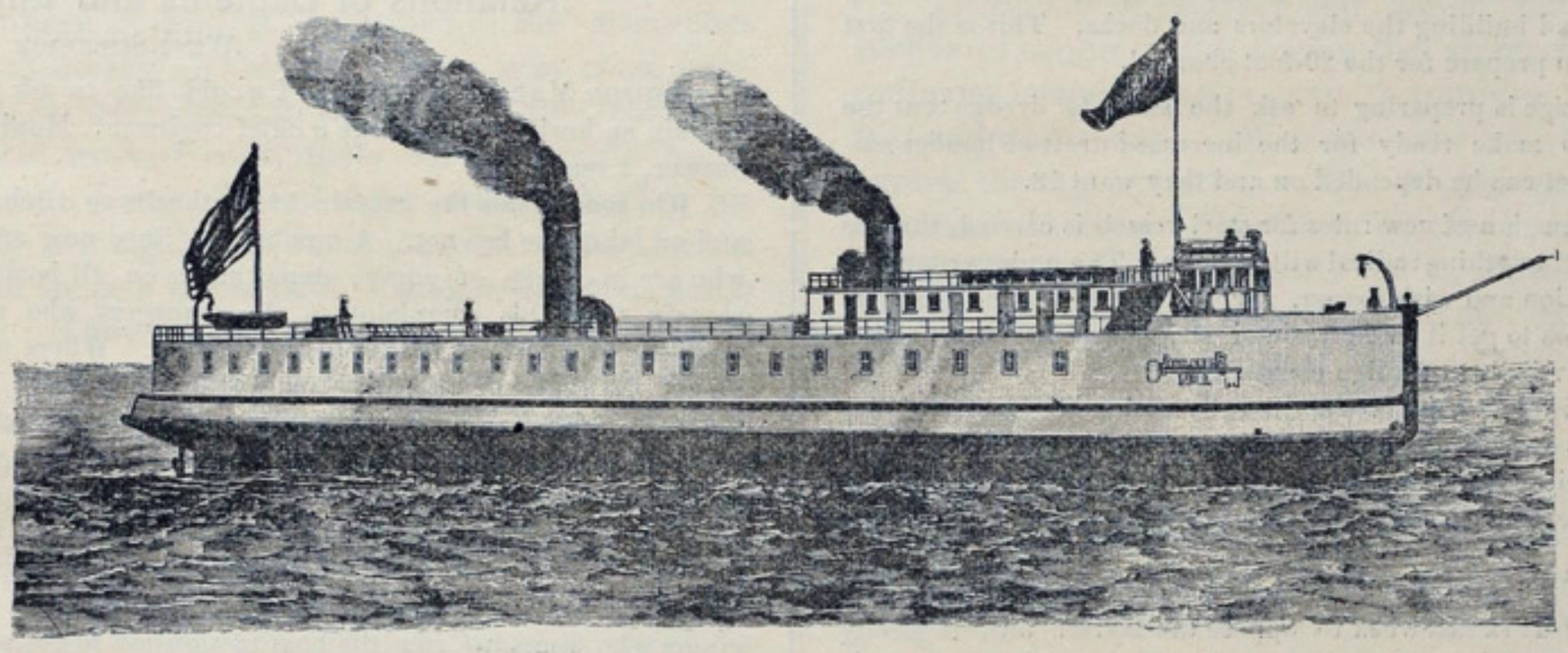
In an article printed by an eastern marine paper that is making strenuous efforts to gain a foothold on the lakes, Fred A. Ballin, naval architect and manager of the Detroit Boat Works, makes some very sweeping charges against the builders of the Western Reserve and W. H. Gilcher, and arraigns the builders of a boat that struck a rock in the Detroit river last fall for their style of water bottom construction. Comparison between the practice of builders of steel vessels on the lakes is made with the Detroit Dry Dock Company, with great discredit to the former and commendation to the latter. That the Detroit Dry Dock Company has a most rigid practice of testing all material that goes into their vessels is well known, but whether these damaging statements as to practice of other ship building companies on the lakes will stand unrefuted remains to be seen. The use of the personal pronoun "we" when speaking of the Detroit Dry Dock Company, would indicate that the article emanated from that company, but considering the conservative attitude of that well managed concern immediately after the accidents noted, this hardly seems probable. The article is carefully written, which would indicate that it is certainly not the product of an erratic interview. Following are some of the more important statements in the article:

"When the Western Reserve broke in two, the public had a right to be distrustful of these huge steel freighters, but the second accident, instead of decreasing this distrust, ought to have produced the contrary effect and restored the confidence of both owners and underwriters in steel ships, inasmuch as the accidents happening to *sister ships* shows that these particular ships must have had some specific defect not common to others of the same class. If not, why did such boats as the wooden ship John F. Eddy, which first reported the accident of the Gilcher, passing only a few hours behind her, or the line steamer Albany, which only has a constructional depth of 17½ feet, outlive the same storms? * * * * An assertion was printed from the same authority that both steamers were the best the company had ever built, and that they were second to none on the lakes. This claim stands unrefuted as yet, and would probably remain so, if it was not in the interest of lake ship builders in general to subject the same to a thorough ventilation. A sense of etiquette forbids such builders as the Detroit Dry Dock Company to become their own champion, and so far comments and criticism have emanated only from owners and newspaper men, whose judgment may be valuable in their calling, but who lack the complete knowledge of marine architecture. I held the position of head draftsman for the Detroit Dry Dock Company for nearly ten years, and remember the first steel boats built of Bessemer steel made and tested according to Lloyds requirements, and also remember that for a time we seriously considered the probability of returning to iron for material, for the reason that it was almost impossible to get a homogenous stock of steel, even in the same plate. We had laboratory tests made of every sheet, and even then found that plates and angles would crack in handling, heating or punching. We then (nearly seven years ago) came to the conclusion that steel made to stand Lloyds tests was unfit for ship building.

"While most ship yards, some of which turned out as many as a boat every month, took for material *bona fide* anything the mills were willing to designate as Lloyds test ship steel, made by by the Bessemer process, without restriction in sulphur or phosphorus, paying for the same only $36.00 per ton, this one yard employs the services of inspectors and chemists, asks for open hearth steel of 25 per cent. reduction, a restriction in sulphur or phosphorus, a reduction of not less than 45 per cent., and actual weight of not less than 2½ per cent. below the theoretical, put up with the many delays incurred by such rigid inspection, which oftentimes results in the rejection of whole carloads, and paid $46 for every ton. No wonder they couldn't compete. In a large steamer of 320 feet water line and about 1,200 tons of material, the difference in the cost amounts to $12,000, a neat little fortune to save, if owners are satisfied and underwriters acquiesce. What is said in reference to material for plates and angles applies as well for rivets. Only one shipyard on the lakes uses steel rivets (!!); all others use *iron*. * * * * Considering that in a 300 foot hull about 80 tons of rivets are used, and that the difference in cost of material is about the same as in plates, it is safe to estimate that such a hull costs about $3,000 more fastened with steel rivets than with iron rivets.

"Two ships, built by differeht firms struck bottom in the Detroit river this fall and an opportunity was offered to make some instructive observations and comparisons. The one boat, being built of first-class material, did not show a single break in any plate. The plates were buckled and contorted, stretching the rivets in their holes without tearing them, but the injury at no point went over eight inches in a vertical direction, leaving the inner bottom untouched. No cargo was wetted and the damage was repaired in a few days. The water bottom was built after the so-called cellular or bracket system approved and practiced by most European builders. The other ship taught a lesson. Her plates were broken wherever she struck, at many places into small three-cornered pieces like splintered glass; the rivets were without heads or sheered off and the inner bottom was pierced in many places. The cargo was practically spoiled and lost. This water-bottom was built after a less costly system, an ordinary solid floor-plate construction with longitudinal solid keelsons on top of them —a system abandoned in England nearly eighteen years ago.

It would doubtless be of interest to vessel owners as well as to underwriters to inspect a piece of plate taken from the first of the above mentioned ships after the accident, and then take a look at the other vessel which is now undergoing repairs. Such a trip would greatly add to their instruction and assist them to discover some of the causes why steel boats founder."



ANN ARBOR NO. 1, CAR FERRY.

## Ann Arbor Car Ferries.

The engraving herewith shows the car ferry Ann Arbor No. 1, now in service between Kewaunee and Frankfort, in connection with the Toledo, Ann Arbor and Northern Michigan Railway Company. Ann Arbor No. 2 is a duplicate of No. 1. Either will carry twenty-four loaded freight cars at a speed of about 12 miles an hour. The dimensions are 267 feet over all, 52 feet beam and 18½ feet deep. The three engines were built by S. F. Hodge & Co., Detroit, Mich., and are horizontal compound, 20 by 40 inches, having 36 inches stroke, and each developing 610 horse power at 86 revolutions. One engine operates a screw at the bow, used for breaking ice, and the other two turn the twin screws at the stern. Steam is supplied at 125 pounds pressure by three fire box boilers, two of which are 15 by 10½ feet and one 15 by 6½ feet. The hulls were built by the Craig Ship Building Company. The engraving is reproduced from the Engineer, New York. The boats no doubt suit the trade for which they were built, but if they are to be pitted against the new Canadian revenue cutters as provisional war ships, in accordance with the stories of sensational newspaper writers, Canadians need not lay awake nights.

## The Underwriters—Buffalo Port Matters.

Special Correspondence to the MARINE REVIEW.

BUFFALO, N. Y., Jan 12.—Now that it is the intention of holding the annual meeting of the Inland Lloyds in Detroit in conjunction with that of the Lake Carriers' Association the interest increases. Though some effort has been made to keep it quiet, a sort of plan for reorganizing the method of inspection has been drawn up and submitted to local vessel owners and underwriters. It will be seen to have originated with owners of high-class vessels. The plan provides for a board of inspectors composed equally of vessel owners and underwriters, the underwriter to agree not to insure vessels not regularly inspected; inspection to be on application and a fee to be paid by the vessel; other expenses to be divided between the Lake Carriers' Association and the underwriters. All this appears to be agreeable to some interests, but a proposition to assess cargo rates according to the vessel's class brings out determined opposition on the part of low-class vessel owners.

Craig & Son, of Toledo, will soon own the steamer John B. Ketcham. The firm has a heavy builder's mortgage on her and when her owners went to pieces Mr. Craig had to come down and pay up all the libels against her, $5,000 or more. He will also have to pay $7,000 in repair bills. Then he will foreclose his mortgage and buy her in.

Buffalo Lodge, No. 1, E. M. B. A., elected the following officers last Saturday night: President, L. P. Goodale; first vice president, E. F. Thorpe; second vice president, John Perew; financial and recording secretary, W. E. Clarke; treasurer, A. J. McDonald; trustee, Thomas Burton. There are 166 members. Installation takes place next Saturday night, when the appointive officers will be announced.

News comes from New York that the $20,000,000 scheme for developing the property on the lake shore beyond the Tifft farm has gone through, and that contractors have been found who will take the company's bonds in pay for digging the canals and building the elevators and docks. This is the first real move on the lakes to prepare for the 20-foot channel.

The Lumber Exchange is preparing to ask the state to dredge out the Erie and Ohio basins, to make ready for the increased draft of lumber carriers. Only about 12 feet can be depended on and they want 18.

The further the discussion of new rules for steel vessels is carried, the less likely does it appear that anything radical will be done. The underwriters are afraid of ocean competition and with reason, for the latter would doubtless take this business at a loss to get it and an added stringency in classification would tend to drive the vessels to foreign companies.

The failure of government engineers and local vessel men to work together is shown in the disputes over Niagara river channel. The engineer has it that there is water sufficient for anything bound to Tonawanda, while the vessel owners are bound there is not and say that the ranges will run a light-draft tug on the bottom.

Secretary Keep of the Lake Carriers' Association, who attended the vessel owners' meeting in New York last week to oppose the Harter bill, is pretty sure it can be beaten, though it has already passed one house. It is obnoxious to the marine interests, because it forbids the vessel owner to decrease his liability by putting any disclaimer on the bill of lading. A committee of three lake owners, three sea-coast owners and three foreign trade owners was appointed to look after the bill and marshal the opposition to it.

## Not a New Light.

Special Correspondence to the MARINE REVIEW.

WASHINGTON, D. C., Jan. 12.—Commander Robley D. Evans, naval secretary of the light-house board, upon being asked concerning the Schirm flash light, recently experimented with for coast light purposes by light-house officers at Tompkinsville, N. Y., said there was an interesting history connected with the apparatus. "As you know," said Commander Evans, "it is claimed to be a foreign idea and was brought to the attention of the light-house board during Commander Coffin's term of office, when I was cruising in Behring sea. When I succeeded Commander Coffin the matter came to my knowledge in the routine of business, and after examining the invention I found that it was almost similar to one gotten up by myself and Lieut. W. M. Wood. which was patented Dec. 11, 1877. We sent to the patent office for the design of our apparatus, and upon comparison found the Schirm light to be of the same principle as our idea of 1877."

Commander Evans produced the two designs and explained the workings of each. The only difference in them, he said, was that the Schirm apparatus adds benzine gas to the magnesium, which makes it more combustible when thrown through the flame, which was unnecessary in the arrangement of his apparatus. The Schirm light, he said, was an excellent one, but more complicated than the Evans and Wood lamp, which had been tested by the navy department, the signal corps and the army and found to work well. The new invention causes a much more intense light even than that of electricity. The electric light is absorbed by the moisture in the air and by the fog, while the magnesium flash is able to withstand those elements. Major Heap, who conducted the tests at Tompkinsville, reports that the Schirm light is an infringement of the American patent.

## Lake Receipts of Coal at Milwaukee.

W. H. Simpson, superintendent of the Northwestern Fuel Company's business at Milwaukee, has compiled for Harbor Master Trowell the following statement of coal receipts by lake at that port during the past season:

| | Anthracite, Net tons. | Bituminous, Net tons | Total for Season, Net tons. |
|---|---|---|---|
| Northwestern Fuel Co | 191,470 | 56,728 | 248,191 |
| H. M. Benjamin | 125,820 | 43,662 | 169,482 |
| Phila. & Reading C. & I. Co | 149,758 | 6,970 | 156,728 |
| Coxe Bros. & Co | 105,716 | 20,159 | 125,875 |
| R. P. Elmore & Co | 63,672 | 5,468 | 69,140 |
| Lehigh & Franklin Co | 20,847 | 32,185 | 53,032 |
| Pennsylvania Coal Co | 40,503 | 2,339 | 42,842 |
| B. Uhrig & Son | 30,077 | 12,045 | 42.122 |
| Whitnall & Rademaker | 36,053 | ..... | 36,053 |
| L. Henes, Jr., & Co | 15,129 | 5,656 | 20,785 |
| J. Gross & Sons | 23,318 | 1,272 | 24,590 |
| Dan Orth & Co | 9,743 | 2,096 | 11,839 |
| Brigham & Co | ..... | 32,630 | 32,630 |
| Eastman Coal Co | 12,336 | 6,293 | 18,639 |
| J. Christiansen & Co | 5,428 | ..... | 5,428 |
| Chas. F. Haase Coal Co | 6,853 | ..... | 6,853 |
| Milwaukee Coal Co | 21,373 | 1,650 | 23,023 |
| Wm. Callaway | 4,600 | ..... | 4,600 |
| Schlitz Brewing Co | ..... | 13,271 | 13,271 |
| Milwaukee Gas Co | ..... | 21,554 | 21,554 |
| D. W. Howie | ..... | 13,134 | 13,134 |
| John Pynchon | ..... | 17,031 | 17,031 |
| Sunday Creek Coal Co | ..... | 6,550 | 6,550 |
| Miscellaneous | ..... | 19,730 | 19,730 |
| Total net tons, 1892 | 862,696 | 320,423 | 1,183,119 |
| Total net tons, 1891 | 762,735 | 243,921 | 1,006,656 |

## Relations of Captains and Engineers.

WEST SUPERIOR, Wis., Jan 4, 1893.

EDITOR MARINE REVIEW: I would like to ask you a question. Has a captain authority to discharge a chief engineer? Hoping that you will kindly answer, I remain, W. A.

[On some boats the captain has authority to discharge the chief engineer and on others he has not. A number of lines now employ engineers ashore, who are in charge of engine departments on all boats, and in such cases the captain takes his complaint to the managers, who usually confer with the engineer in question before taking action. Where no chief engineer is employed the captain's authority comes from the owner, and it usually includes the right to discharge chief engineer as well as all other hands. The better class of masters make use of this authority only when it is positively necessary, as no boat can be managed well by continually changing men. If the loss through changing engineers, especially, could be figured up, there would be less of it, and the captain who discharges an engineer through a slight disagreement or for personal reasons is not a good officer, and the engineer who wants to run the boat in addition to taking care of his engines is equally incompetent. Common courtesy between the men responsible for the care of lake steamers would save a great deal of friction. How much enmity and hatred would be prevented if the captain would mention the engineer and the engineer would mention the captain when telling of a fast run or of saving a shipwrecked crew. If *we* instead *I* was used in many cases of this kind, the boats would be run better and more economically.—ED.]

## Largest Vessels on the Lakes.

BUFFALO, N. Y. Jan. 5, 1893.

MARINE REVIEW:—Sir: Are there any larger boats on the lakes than the Chemung? If so, name some of them, and oblige, MARINE ENGINEER.

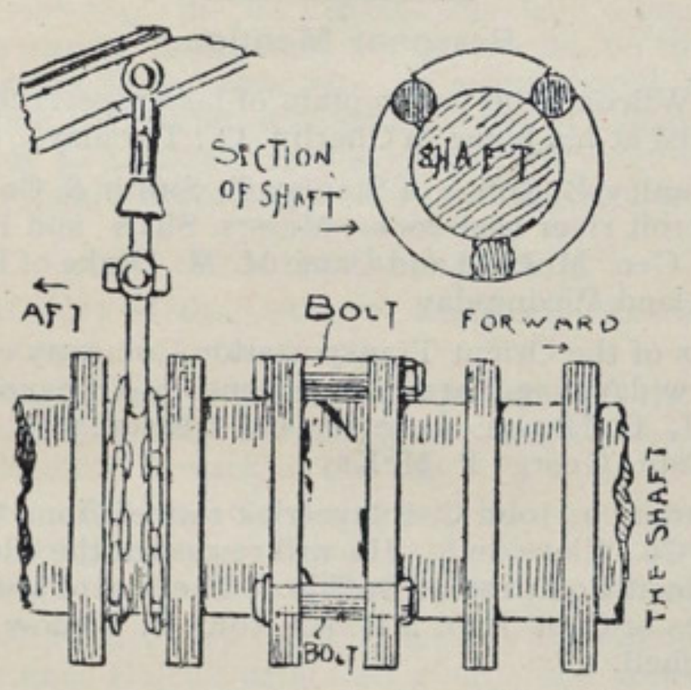
[The Owego and Chemung are 350 feet 7 inches over all, 324 feet 10 inches keel, 41 feet beam and 25 feet 6 inches deep. There are two boats on the lakes, the Maritana and Mariposa, that have 330 feet keel, but lack seven inches of being as long over all as the two Erie liners. Next spring five new boats will go into commission that will, however, be longer over all than the Chemung and Owego by from 10 to 30 feet. Two of them are launched now. One is the whaleback passenger steamer, 361 feet over all, and the other is the Selwyn F. Eddy, 360 feet over all. The two largest freight boats on the lakes are building at F. W. Wheeler & Co's yard for the Hawgood & Avery Transit Company and D. C. Whitney. They are 377½ feet over all, 360 feet keel, 45 feet beam and 25 feet deep. The Great Northern passenger steamers building at the yards of the Globe Iron Works Company are 380 feet over all and 360 feet keel.—ED.]

NEARLY EVERY SHIPBUILDER ON THE LAKES HAS BEEN FURNISHED WITH PATTERSON'S NAUTICAL DICTIONARY AND NO SHIPBUILDER SHOULD BE WITHOUT IT. THE DIAGRAMS OF WOODEN, IRON AND STEEL VESSELS AND MARINE ENGINES IN IT ARE ALONE WORTH THE PRICE OF THE BOOK. IT WILL BE SENT TO ANY ADDRESS FOR $5, OR THE DICTIONARY AND THE MARINE REVIEW, ONE YEAR, $6. WRITE TO MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O.

## How the Umbria's Shaft Was Repaired.

To the practical vessel man the most interesting feature in all the detail concerning the accident to the Cunard line steamer Umbria was the skillful work of her engineers in repairing the broken shaft. On the afternoon of Friday, Dec. 23, with the great single-screw flyer breasting the gale beautifully, and leaving eighteen miles behind her each hour, Chief Engineer Tomlinson felt worried about his charge, for he had discovered a bad spot in the thrust shaft. This is that part of the big shaft which takes up any lateral motion that may occur in the line or main shaft. He watched the machinery anxiously. The ship was running right into the teeth of a tremendous winter storm, and the strain on the big shaft and screw was enormous. At 5 o'clock the great piece of steel showed signs of succumbing, and to Captain Horatio McKay, standing on the bridge, there came the startling message from the engine room: "Thrust shaft cracking." In obedience to instant orders the big Cunarder's screw ceased to revolve and her race against time was done. Luckily the ship had been heading so directly into the storm that she lay head on when she stopped.

The various attempts of the captain and officers on deck to secure a tow while the big broken down steamship drifted in the furious gale from Friday until the following Monday, and the feeling of anxiety among the passengers as each of the several vessels sighted failed for one cause and another to render material assistance, have all been graphically described in the dispatches from New York, but during all this time there was some magnificent work going on deep down in the ship. Chief Engineer Lawrence Tomlinson worked continually for forty-eight hours after the accident, then got two hours' sleep without taking his clothes off and went at it again. The engineers of the Umbria lacked a blacksmith shop, a steam drill, a steam hammer, and a dozen other things. They were cramped even for room to work in, and the tossing and rolling of the big hull did not add to the comfort of the men who were trying to patch np the great shaft. Soon after the accident to the thrust shaft it was found that the fracture was in a bad place. It was between the two collars nearest the engines, and ran diagonally across the shaft, extending along and inside of one collar for more than three parts of the circumference of the shaft, then running crossways next to the after collar. Then the fracture ran horizontally to the forward collar. Thus the thrust shaft was practically, if not theoretically, severed.




SECTION OF SHAFT SHOWING BREAK AND REPAIRS.

The shaft was twenty-six inches in diameter. As it had no support for a length of twenty-six feet, it was decided to support it by chains which were fastened to the dome of the shaft tunnel. The the top of the shaft tunnel was trussed so that it could support the strain. After that there began the most laborious task imaginable. Without many tools, without many necessary parts, the engineers started on their task. With no other appliances than hand vices, hand drills, cold chisels and hammers, the work of sinking deep key ways or gaps into the iron shaft was begun. To find bolts which would serve in holding the shaft together, Mr. Tomlinson ransacked the ship. At last he found a number of tunnel shaft coupling bolts, and decided to make them answer. A clamp as large as could be got in between the collars was then made and bolted fast, and the collars themselves were then cut down to the body of the shaft in four places, and 5-inch spare coupling bolts fitted to them. This work took seventy-two hours. At last the work was finished, and at 3 o'clock on Tuesday morning the engines were started up with much anxiety. They were turned over very slowly, indeed, but the shaft seemed to hold and the ship made fair progress for two hours. At 5 o'clock in the morning the head of one of the bolts broke and the ship lay to for sixteen hours till a new bolt was put in. At 9 o'clock that night she started up again, and ran until 6:30 o'clock on Wednesday night. Then another bolt broke, and it required until 8:30 p. m. on Wednesday to repair it. The engines were started up again at that time and the vessel worked her way slowly along the coast at the rate of about six knots an hour. Luckily the weather was moderating steadily and the sea was calming daily. On Thursday the Umbria took on her pilot, and early Saturday morning with a white haze lying over the bay, the big ship steamed into quarantine at New York.

## Irrepressible Holman.

There will be no river and harbor bill introduced at this session of congress, but among the secretary of the treasury's estimates is one of $16,115,750, to continue work already authorized and under way. Of course, the irrepressible Holman will oppose the appropriation. He designs to cut it down to $4,000,000. Chairman Blanchard of the committee on rivers and harbors, knows the necessity of it, however, and will fight against any reduction whatever. The work in question was authorized only after the most careful investigation by the army engineers, and must be completed. Delays are expensive, and hence it will be economical to push the work to completion, which can only be done by the prompt appropriation of the sum recommended by the secretary of the treasury. Holman got several black eyes during the last session; he should be effectually squelched at the present one.—Marine Journal.

## Successful Feed Water Heater.

A feed water heater and purifier that is in use on twenty-five lake steamers must have merit. A good many different kinds of feed water heaters have been tried on lake steamers, but have come to grief through some defect or another. The inventor, who is a practical lake engineer, says that he found the best way to keep a boiler clean was to prevent the sediment from getting into it. This is accomplished in his apparatus by gravitation. The water is subjected to the same treatment as it receives in the boiler, except that in the apparatus the water is heated by direct contact with the steam. The water starting at the top of the purifier, falls from one plate to another, being agitated into spray and heated in its downward passage. It reaches the settling chamber, where it passes under the division plate and through separators before it rises and passes through the center tube on the way to the boiler. Not only are all substances having a higher specific gravity than water excluded, but those of lower gravity are kept out by the equalizing tube in the center, extending below the surface. Through heating the feed water the unequal expansion of boilers is prevented and the life of the boiler prolonged. The only attention required is the turning of a valve to clean out the settling chamber once in six hours. The Union Dry Dock Company, the chief engineer of the China, and many others recommend it highly. R. Hammond, Lake Erie Boiler Works, Buffalo, says: "It is the most perfect feed water heater and purifier we ever saw. The water enters the boiler almost perfectly pure at a temperature equal to that in the boiler." For further particulars as to sizes, prices, etc., write Robert Learmonth, 200 Bouck avenue, Buffalo, N. Y.

# MARINE REVIEW.

*DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.*

JOHN M. MULROONEY, . . . . . } PROPRIETORS.
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IT was not a vessel owners convention that assembled in Washington on Thursday of this week to ask congress for a survey of routes for a ship canal through American territory from the lakes to the seaboard. The proposed canal would not put an additional dollar into the pocket of a vessel owner. It is the great and growing country beyond the head of Lake Superior that demands this immense improvement and the benefits are to be distributed to the people of the whole land. Opposition from railways, from southern states and from the city of Buffalo will be spurred to activity by the convention at the national capital, which now asks simply for a survey, and as Gen. Poe, the father of great engineering works on the lakes, said a few days ago, the men who are now leaders in the lake marine will propably not live to see this big project carried out, but it will come just the same, and the construction of the canal will soon be one of the greatest questions demanding the attention of the American people.

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COMMANDER NICOLL LUDLOW U. S. N., whose efficient services while in charge of lighthouse matters on Lake Michigan commended him most favorably to the vessel interests, has been ordered to command the Mohican, third rate, ten guns, flagship of the Pacific station. The Mohican is at Mare Island, Cal., and after repairs will probably sail for Honolulu. Lake vessel owners, who regretted losing commander Ludlow, know a good officer when they find him as well as the heads of the navy department who have given him such an important command.

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DO NOT call the deep water channel throughout the lakes, upon which work will begin next spring, a 21-foot channel. The depth of 21 feet will be reached in only a few places, where a slight increase will be required in order to secure clear 20 feet throughout. General Poe says this new waterway, properly speaking, will be a 20-foot waterway, and he should certainly be considered an authority on the subject.

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WASHINGTON dispatches announce that the army court of inquiry now hearing the Col. Ludlow case will probably be in session for several weeks. Friends of Col. Ludlow have no reason to fear an exhaustive inquiry. They are confident of the result now—that an impartial investigation of facts is being made.

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## Proposed Dry Dock at the Sault.

On a trip to Marquette for iron ore during the past season, Capt. Charles M. Swartwood, of the steamer J. H. Wade, had with him as a passenger Mr. George T. Bishop of Cleveland, who is commercial agent for the Toledo, St. Louis & Kansas City Railway. Mr. Bishop was impressed with the prospects of success attending the establishment of a dry dock plant at Sault Ste. Marie, and after an investigation of the subject succeeded in interesting Wm. A. Sproul, of Philadelphia, in his plans. Capitalists of New York and Cincinnati have since been enlisted in the scheme, and the town authorities at Sault Ste. Marie show a willingness to give substantial support to any enterprise of this kind. The projectors of the dry dock will leave Cleveland for the Sault Friday evening and if a satisfactory bonus is offered to them may begin work soon on an industrial enterprise long sought by the people of the canal town.

## Dry Dock Managers.

Thomas Dunford of Dunford & Alverson of Port Huron, H. J. Mills of Buffalo, Brice A. Miller of the Miller Bros., Dry Dock Company of Chicago, F. C. Starke of Milwaukee and Edward Gaskin of the Union Dry Dock Company, Buffalo, were the managers of docks in lake cities other than Cleveland who attended the annual meeting of the Dry Dock Association in Cleveland Wednesday. The two Cleveland dock companies were also represented, and although none of the officers of the Detroit Dry Dock Company or the American Steel Barge Company, operating the new Superior dock were in attendance, it was understood that they would co-operate with the association. Last year's schedule of rates was adopted.

Mr. Dunford of the firm of Dunford & Alverson, Port Huron, says that both docks operated by that firm were busy all summer, working night and day. Lake vessel owners who are generally favorably disposed toward this firm will be pleased to learn that the big investment in the very large dock recently constructed by them has proved a profitable venture, and although Port Huron is not favorably located for winter work, they have two boats, the Nelson and Ida Keith, upon which large repairs will be made. The underwriters who own the Ida Keith will sell her.

Mr. Gaskin has also secured work enough to keep the Buffalo plant busy during the winter, notwithstanding the unfavorable outlook for ship yard work at Buffalo some time ago.

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## Seven Engines and Nineteen Boilers.

The Dry Dock Engine Works of Detroit has closed a contract with Capt. James Davidson of West Bay City for the machinery equipment of two steamers now under construction at his ship yard One set of engines, according to the contract, will be of the fore and aft triple expansion type, cylinders 20, 33 and 54 inches by 42 inches stroke. Boilers for these engines will be 12 by 14 feet, supplying steam at 160 pounds, with natural draft. The second set will also be fore and aft triple expansion, with cylinders 16, 24 and 38 inches by 24 inches stroke, receiving steam from one cylindrical boiler, 12 feet 3 inches diameter by 11 feet 3 inches long, allowed 160 pounds pressure and fitted with the Howden draught system. This makes seven engines and nineteen boilers which this company now has under contract.

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## Personal Mention.

L. H. Wilcox, who was captain of lake vessels for a number of years, died at his home in Oberlin, O., Tuesday.

Mr. Stanley B. Smith of Stanley B. Smith & Co., owners of the big Detroit river coal docks, Messrs. Shaw and Eddy of Bay City, Capt. Geo. McLeod and Capt. M. M. Drake of Buffalo were all in Cleveland Wednesday.

Officers of the Orient Transportation Company of Cleveland elected a few days ago are: President, A. C. Saunders; vice-president, L. C. Hanna; secretary and treasurer, J. J. Purcell; manager, Capt. George P. McKay.

On Jauuary 1, John C. Fitzpatrick retired from the firm of Mitchell & Co., Cleveland. He will represent the Cleveland and Buffalo Transit Company at Buffalo. The firm of Mitchell & Co. now consists of Capt. John Mitchell, John F. Wedow and Capt. Alfred Mitchell.

Capt. F. H. Rae of the Bradley fleet and Capt. John Edwards, formerly master of the excursion steamer Pearl, will command the Cleveland and Buffalo line steamers State of New York and State of Ohio, to run between Cleveland and Buffalo next season. The selection from many applications are good ones, both men being well known and popular. The line will no doubt do a big Niagara Falls excursion business.

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SEND ONE DOLLAR IN STAMPS TO THE MARINE REVIEW FOR TWENTY PHOTOTYPES AND GRAVURES OF LAKE STEAMERS NEATLY BOUND.

## Iron Mining.

VALUE OF LEADING STOCKS.

*Quoted by Chas. H. Potter & Co., No. 104 Superior St. Cleveland, O.*

| Stocks. | Par Value. | Bid. | Asked. |
|---|---|---|---|
| Cleveland-Cliffs Iron Company | $100 00 | $..... | $ 54 00 |
| Champion Iron Company | 25 00 | ..... | 35 00 |
| Chandler Iron Company | 25 00 | ..... | 40 00 |
| Jackson Iron Company | 25 00 | ..... | ..... |
| Lake Superior Iron Company | 25 00 | ..... | ..... |
| Minnesota Iron Company | 100 00 | 64 00 | 68 00 |
| Pittsburgh & Lake Angeline Iron Co. | 25 00 | ..... | 135 00 |
| Republic Iron Company | 25 00 | 9 25 | 10 25 |
| Ashland | 25 00 | ..... | ..... |
| Section Thirty-three | 25 00 | ..... | 4 00 |
| Brotherton | 25 00 | ..... | ..... |
| Iron Belt | 25 00 | ..... | 2 00 |
| Aurora | 25 00 | 8 00 | 9 00 |

Mr. Charles F. Howe, consulting and mining engineer of Duluth, who recently formed a partnership with Mr. E. P. Jennings in the business of analytical chemistry and allied work, sends us the following analysis of some Mesaba ores:

| NAME OF ORE OR MINE. | Iron. | Phosphorus. | Silica. | Manganese. | Alumina. | Magnesia. | Lime. | Sulphur. | Combined water. |
|---|---|---|---|---|---|---|---|---|---|
| Biwabik, No.1-H.M.C. | 65.29 | .037 | 1.95 | .193 | ..... | 1.13 | None. | ..... | ..... |
| Iron King M. Co. | 63.80 | .038 | 4.52 | ..... | ..... | ..... | ..... | ..... | ..... |
| New England | 64.40 | .027 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ohio Iron Co. | 63.44 | .053 | 5.92 | .667 | ..... | ..... | ..... | ..... | 4.06 |
| Mountain Iron | 63.78 | .042 | 5.64 | .155 | ..... | ..... | ..... | ..... | 2.67 |
| Mesaba Mountain Iron | 61.73 | .055 | 5.07 | .5 | ..... | ..... | ..... | ..... | 2.52 |
| Cincinnati | 63.40 | .035 | 6.47 | .28 | .87 | .34 | .42 | .021 | ..... |
| Rouchleau | 63.00 | .045 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Lone Jack | 62.39 | .054 | 6.85 | 1.28 | ..... | ..... | .28 | ..... | 3.74 |
| McKinley | 62.46 | .021 | 8.03 | .77 | ..... | ..... | ..... | ..... | 1.76 |
| Great Western M. Co. | 63.18 | .050 | 5.06 | ..... | ..... | ..... | ..... | ..... | ..... |

"The Biwabik was sampled and analyzed," Mr. Howe says, "by Mr. H. M. Curry of Pittsburg, and represents a fair average of their No. 1 ore. They have a No. 2 grade which is not here represented. The Cincinnati represents the average of a stock pile of about 10,000 tons. The sample was taken and analyzed by outside parties. The Rouchleau represents the quality as sworn to by those in interest. The Iron King, New England, Lone Jack and Great Western are from samples taken by interested and uninterested parties, and the analysis made in this office. I can not say that they represent all the pits nor as to the fairness of the sample, but judge that they will represent fairly well the quality of the No. 1 ore to be mined from these properties. The Mountain Iron, the Mesaba Mountain Iron and McKinley were taken from a report coming from the state geologist."

Stockholders of the Cleveland-Cliffs Iron Company are receiving the second installment of 1½ per cent. on the 3 per cent. dividend declared some time ago. It is announced on very good authority that the Aurora will certainly pay $1 a share in February and probably $2 a share, Iron stocks are very flat, even the new Mesaba stocks are exceedingly slow in changing hands.

## Around the Lakes.

Capital stock of the Detroit & Cleveland Steam Navigation Company is now $1,000,000.

A Chicago house wants 100,000 pictures of the Sault canal and lock for the world's fair this year and a photographer at the Sault is said to be at work on the job.

The steamer Greyhound will run between Toledo and Detroit the coming season. Toledo capitalists are figuring on the purchase of a steamer to run in opposition to the Greyhound.

The Milwaukee Dry Dock Company is strengthening the wooden steamer Helena with steel chords and arches. She was built four years ago. The barge Northwest is also receiving steel arches at the same yard.

The big wrecking tug, A. G. Wright, burned to the water's edge at Grand Haven last week. She was owned by Thompson, Port Huron, and Capt. James Martin of the Roanoke. Repairs were being made to her machinery.

Preparations are being made by Capt. B. B. Inman of Duluth to place his tug interests in an incorporated company and maintain offices at both Superior and Duluth. The new company will be known as the Inman Towing Association. Ten tugs are now included in the fleet of this concern, and there is talk of purchase of another boat as well as the construction of a new one at the yard of the American Steel Barge Company.

Duluth's board of public works offered a prize of $1,000 for plans for a tunnel under the canal entrance to the harbor. The plans were opened a few days ago. They numbered eighteen and were from engineers in all parts of the country.

Civil engineers in the employ of the Pennsylvania Company are working on plans for new coal docks to be erected at Toledo. The Toledo Railroad Terminal and Dock Company a few days ago paid $200,000 for dock property adjoining the yard of the Craig Ship Building Company.

The Manistee Iron Works is steeple compounding the engines of the Maggie Duncan, wintering at Milwaukee. Her owner, John Duncan of Green Bay, is said to be looking for a barge to carry 1,000,000 feet to put behind the Duncan in the Lake Superior trade.

Duluth elevators will soon be unable to receive any more wheat as they are nearly all full. The elevator companies are patching up some of the old warehouses to accommodate the overflow. None of the railroads have as yet taken any action in regard to discontinuing further shipments but will probably be forced to do so soon.

A report to the effect that the Brazil-Mather collision case had been settled out of court is without foundation. As matters now stand this case will be fought out in court. The Nipigon-Vienna case, involving the loss of the steamer Vienna, has been settled on the basis of a division of damages, the owners of the Nipigon paying $24,000.

Newly chosen officers of Toledo lodge; Excelsior Marine Benevolent Association, are: President, George W. Stoddard; first vice-president, Cooper Herrick; second vice-president, William Leaver; financial secretary, Al Fitts; recording secretary, E. G. Ashley; treasurer, Charles Hubbard; chaplain, James Skeldon; outside guard, Charles Shirbano; marshal, John Edson.

The Jenks Ship Building Company, of Port Huron, has a contract for a fishing tug in addition to the lumber steamers being built to be sold. The tug is to be 95 feet long, 19 feet beam and 9 feet hold, and is for Capt. W. B. Harrow and others. She is to have a double-steeple compound engine. The cost of the boat will be about $10,000.

Hawgood & Canfield, vessel agents of Cleveland, have had prepared a card containing average lake freights on iron ore, hard and soft coal and grain, covering periods of from eight to twenty years, including 1892. The figures were prepared by the MARINE REVIEW, but they appear on the card in much smaller type than in the REVIEW. Write them for a card.

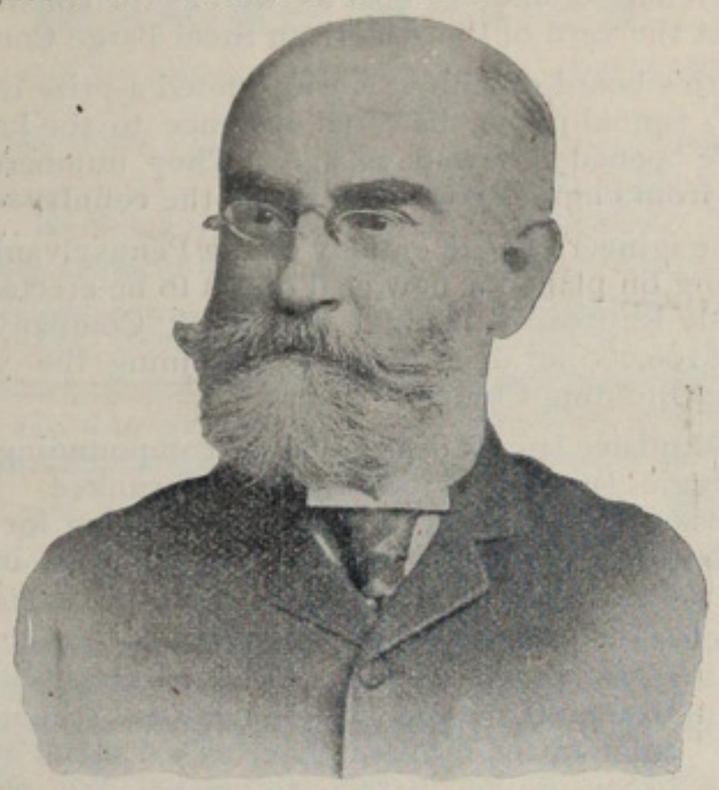
Representatives of the Lake Michigan passenger steamer lines met at St. Joseph recently, presumably to make an agreement for business during the world's fair year. The St. Joseph and Lake Michigan Transportation Company, the Graham & Morton line, Vandalia line and Milwaukee & Eastern Transit Company were represented. Mr. Graham stated that a boat would be leased for his line next year.

Invitations are out for the annual banquet and ball to be given in Port Huron, Jan. 19, at the close of the Shipmasters' Excelsior Marine Benevolent Association grand lodge meeting. Captains Gain, Cox, Rice, Ivers and Cowan make up the committee on arrangements. The festivities will be held in the new armory. It is expected that at least 300 lake captains will be present.

Marine Engineers' Beneficial Association No. 9, Milwaukee, Wis., elected for 1893 the following officers: Past president, W. E. Elliott; president, J. J. Krach; vice-president, S. C. Olson; treasurer, Frank Coons; financial secretary, D. W. Chipman, Jr.; recording secretary, J. E. Lowgy; corresponding secretary, W. E. Elliott; chaplain, W. E. Fell; conductor, Chas. Forsyth; Doorkeeper, Jacob Noble; delegates, J. J. Krach and G. C. Olson. The association has issued very neat invitations to friends to attend their annual ball.

Sloan & Cowles and Jenkins & Knight of Buffalo have contracted with the Crystal Beach Steamboat Company of that city to build a passenger steamer 145 feet long, 32 feet beam and 10½ feet deep. She will be of wood, have twin screws, and will be named the Puritan. The Mills Dry Dock Company will build the hull. The boat will have three water-tight bulk-heads. Engines will be of the triple expansion type. Within a few years an immense local excursion steamer business has been built up in Buffalo.

## Engines of Modern Atlantic Coast Steamers.

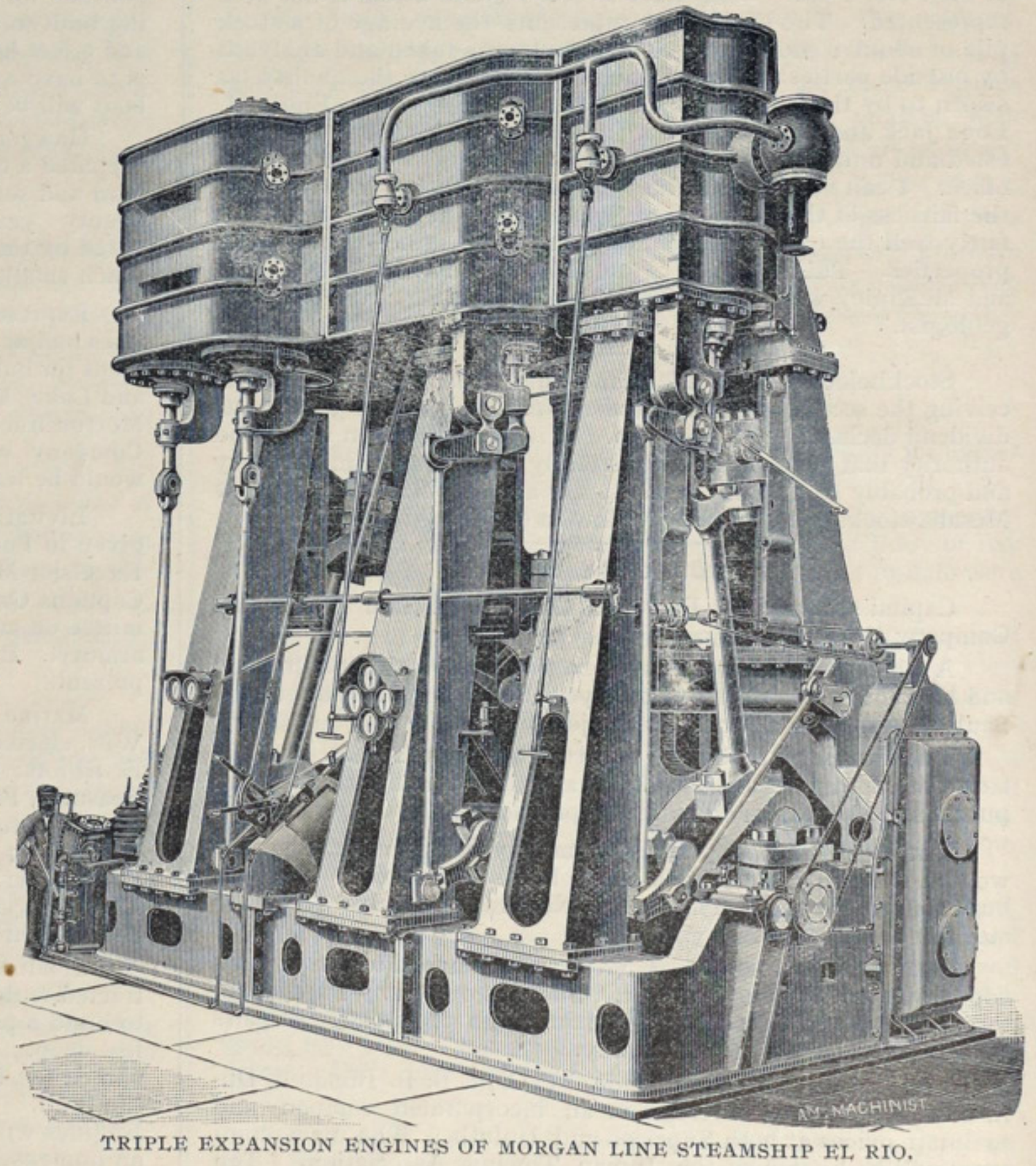


HORACE SEE, NAVAL ARCHITECT.

Horace See, engineer and naval architect of New York, has been prominently connected with the work of constructing in the east some of the best steel steamers of the American merchant marine. A portrait of Mr. See and an engraving of triple expansion engines recently constructed under his direction are presented on this page. For about twenty years previous to 1889, Mr. See, who is now located in New York as a consulting and constructing engineer, was connected with the ship building firm of Cramp & Sons, Philadelphia. He designed the machinery and superintended the construction of many well known vessels, among which may be mentioned the United States cruisers Philadelphia and Newark, dynamite cruiser Vesuvius, gunboats Yorktown, Concord and Bennington, yachts Atalanta and Corsair, steamships El Mar, El Monte, El Sud, El Norte and El Rio of the Morgan Line, Tacoma, San Pedro and San Pablo of the Central Pacific Railroad Company's line, Caracas, Valencia, Philadelphia and Venezuela of the Red D line, Mariposa and Alameda of the Spreckels line, and the twin screw steamboat Monmouth.

The engines shown here are those of the Morgan line steamship El Rio, a steel freight boat, built under the superintendency of Mr. See by the Newport News Ship Building and Dry Dock Company of Newport News, Va., and intended for the New York and New Orleans route. The engines are of the triple expansion type, cylinders 32, 52 and 84 inches diameter by 54 inches stroke. The distribution of steam in the high pressure cylinder is controlled by one piston valve; another valve of the same type performs a similar duty for the intermediate cylinder, and two piston valves are used for the low pressure cylinder. The steam is introduced in the middle of each valve, which prevents the high pressure steam from coming in contact with the valve stem stuffing boxes. All are worked by See-Marshall valve gear, and each valve receives its motion from a separate eccentric. The valves are placed as close as possible to their respective cylinders. In the high pressure and intermediate valve gear, levers are introduced and connected to the valve stem and valve gear in such a manner as to cause the weight of the valve to counterbalance the weight of the connections below the lever, thereby dispensing with counterbalancing cylinders. The engines are reversed by steam. The main pistons are provided with patent adjustable followers. Each follower is cut in three parts, so as to admit of adjustment to compensate for wear and centering without the employment of tail rods, and will at the same time insure a steam tight piston without undue friction. These followers are applicable to horizontal, vertical or inclined engines.

The piston rods of the El Rio are 7½ inches diameter. The crank shaft is 16½ inches diameter; crank pin 16½ inches diameter by 16½ inches long; crosshead pins, 8 inches diameter, 9½ inches long. The shaft is fitted with Smith's adjustable thrust bearing, consisting of go-ahead and backing bearings. The air pump, single acting, is 32 inches diameter, stroke 25 inches. The total cooling surface in the condenser is 6,400 square feet. Steam is furnished by three double-ended boilers, 13 feet 10 inches diameter, and 20½ feet long. Each of the boilers contains six corrugated furnaces of 43 inches inside diameter. The total grate surface is 400 square feet; total heating surface 10,650 square feet; working steam pressure 165 pounds. The propeller is a built-up one with four blades and is 18 feet diameter, with 22 feet pitch. On her trial trip the El Sud, which is a sister ship of the El Rio, and whose engines are a duplicate of those here shown, developed 3,362 indicated horse power, with a steam pressure of 165 pounds, and running at a speed of 73 revolutions per minute. The El Norte is another vessel of this same type recently delivered to the Southern Pacific Company, and still another, not named is on the stocks. These boats, built according to the rules of the American Shipmasters' Association, are all of about 4,500 tons register and they are valued at $525,000. Their principal dimensions are: Length between stem and after side of propeller post, 380 feet; length over all, 406 feet; breadth of beam, moulded, 48 feet; depth from top of keel to top of upper deck beams, lowest part of sheer, 33.9 feet. They have three decks and a partial overlop deck at fore end of fore hold, with iron houses on the awning deck, and are rigged with four iron pole masts. The plant of the Newport News company, the builders, contains seventy-five acres of land, has a water frontage of 2,600 feet and buildings covering seven acres. Credit is due to the American Machinist and American Shipbuilder for engravings appearing with this article.

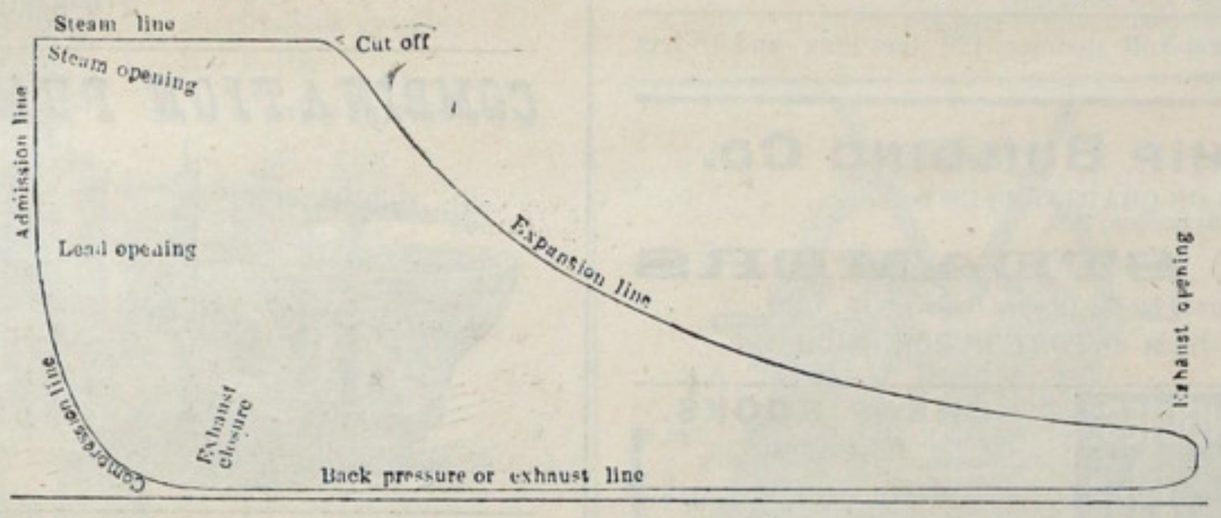



TRIPLE EXPANSION ENGINES OF MORGAN LINE STEAMSHIP EL RIO.

## The Indicator Diagram.

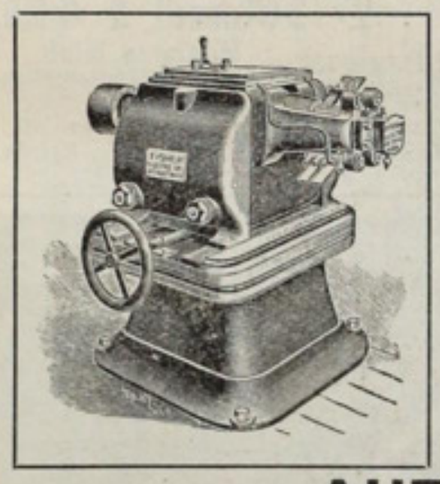
The chief function of the indicator or steam pressure recorder, is to graphically represent the pressure in the cylinder of a steam engine at any or all points in the stroke of its piston. That it must do so is evident, from the fact that the diagram it produces is the compound result of two concurrent movemements —that of the paper drum in coincident with that of the piston of the engine; and that of the pencil in obedience and in proportion to the pressure acting on the piston.

Referring to the illustration, on the left and about midway in the height of the card is a point marked "lead opening." At this point the valve begins to open the steam port at that end of the cylinder at which the card is taken. This occurs a little before the piston reaches the end of the stroke and the crank reaches its position at the dead center, so that when the piston reaches the end of the stroke and the crank is on the dead center, the valve will have opened the steam port for a short distance. The nearly vertical line above the point marked "lead opening" is called the "admission line" and during the period in which the pencil of the indicator draws the line, the steam from the boiler is admitted to the clearance space, raising the pressure,




and consequently the pencil of the indicator to a point which indicates a greater or less approach to boiler pressure, depending on the construction of the valve, amount of lead opening, and length and size of pipe between the valve chest and boiler. The admission line should be nearly vertical. If with a fine pointed pencil, a line is drawn perpendicular to the atmospheric line and just touching the corner of the diagram at the point marked "steam opening," and the admission line inclines away from the perpendicular instead of toward it, it shows that the full initial pressure is not realized until after the piston has started on its forward stroke. At the point marked "steam opening," the steam valve or the steam port is, or should be, opened so rapidly that the full initial pressure will be maintained throughout that portion of the stroke before the point of cut-off. Whether this is so or not is shown by the steam line between the point of steam opening and point of cut-off. If this is parallel to the "atmospheric line," it shows that the valve opens quick enough and wide enough to admit steam from the boiler sufficient to keep up the pressure notwithstanding the forward motion of the piston. If it drops toward the point of cut-off, it indicates that the valve does not open wide enough or quick enough and that the pipe between boiler and engine is not of sufficient size. If, on the other hand, it inclines upward to the point of cut-off, or is higher at the point of steam opening, it shows a very late opening of the steam port, a condition which does not often occur in actual practice. At the point of cut-off marked on the card, the steam port is closed and further admission of steam from the boiler to the cylinder is prevented. The distance between the initial end of the diagram and the point of cut-off, compared with the entire length of the card, shows the proportion of the stroke during which steam is admitted, and according to this proportion the point of cut-off is said to be at 1/5 1/4 1/3 etc., stroke. The point of cut-off is rarely exactly shown by the diagram. Generally the steam line and expansion line are connected by a curved line, more or less irregular. This is shown in the diagram by the short portion of the line immediately following the point of cut-off; where the curve is the reverse of the expansion line. The line between the point of cut-off and the point of exhaust opening is called the "expansion line" and as its name indicates, it shows the fall of pressure during the period when the steam is expanding in the cylinder. This line is frequently wavy, caused by the vibration of the arm carrying the indicator pencil and the oscillation of the spring above the indicator piston. A wavy expansion line should not, however, be taken as indicating corresponding variation in pressure in the engine cylinder, the true line being an average between the extremes of the undulations. The expansion line should chiefly be studied to determine whether any leaks exist in the valves or by the piston, and to this end it is necessary to plot on the card the "theoretical curve."

At the point marked "exhaust opening," the valve begins to open the exhaust port. A well designed valve will generally bring this point of exhaust opening very near the end of the stroke and the valve will open quick enough and wide enough to cause the pressure to drop to the back pressure or exhaust line by the time the piston begins the return stroke. The line between the points marked "exhaust opening" and "exhaust closure" is the back pressure or exhaust line and shows the pressure against the piston in opposition to that on the other side, which forces it forward. The nearer this line approaches to the atmospheric line, the less the back pressure. At the point marked "exhaust closure," the valve closes the exhaust port and the steam remaining in the cylinder is compressed and its pressure raised in proportion to the amount of compression. The line traced during the period when the compression takes place is called the "compression line" and it terminates when the lead opening begins. The atmospheric line, which should be traced on every card taken, is the straight line at bottom.—Exchange.



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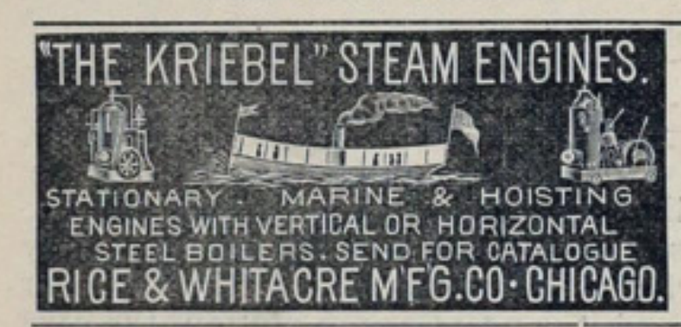
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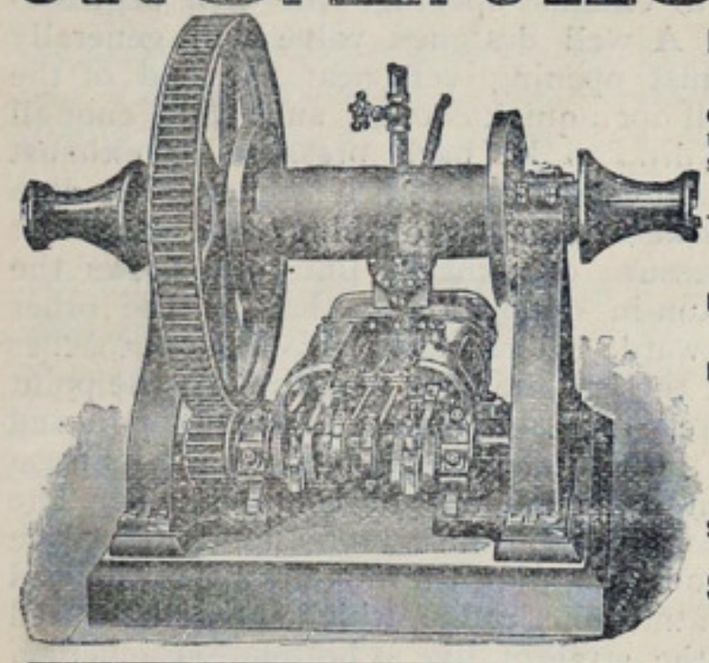

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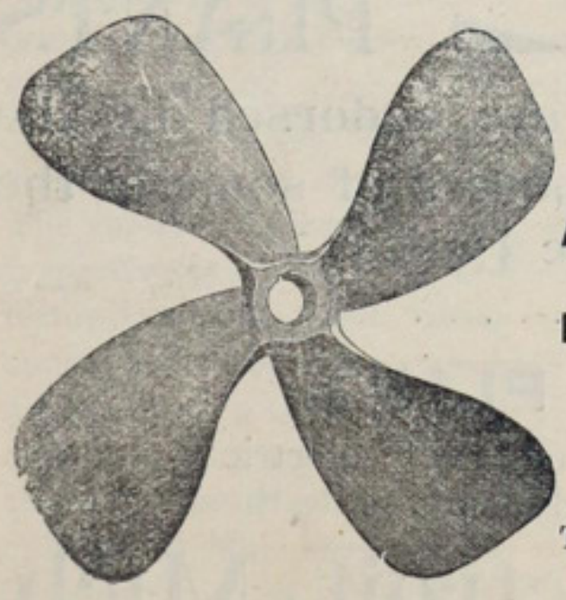

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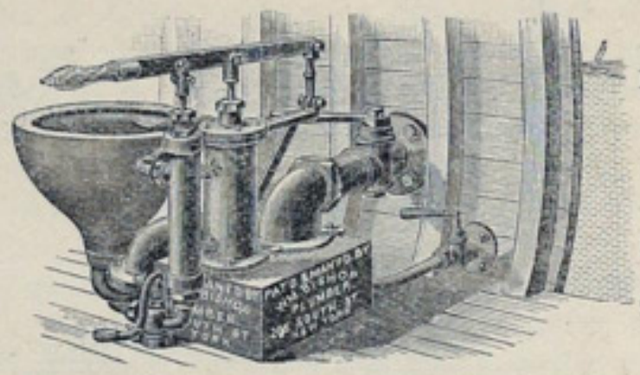

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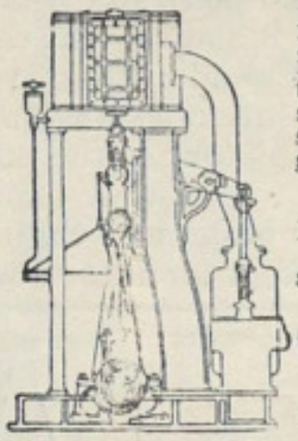

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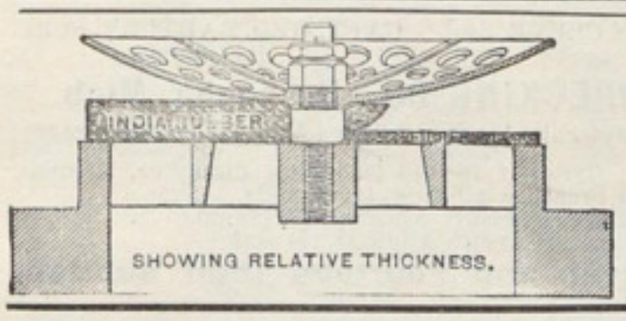


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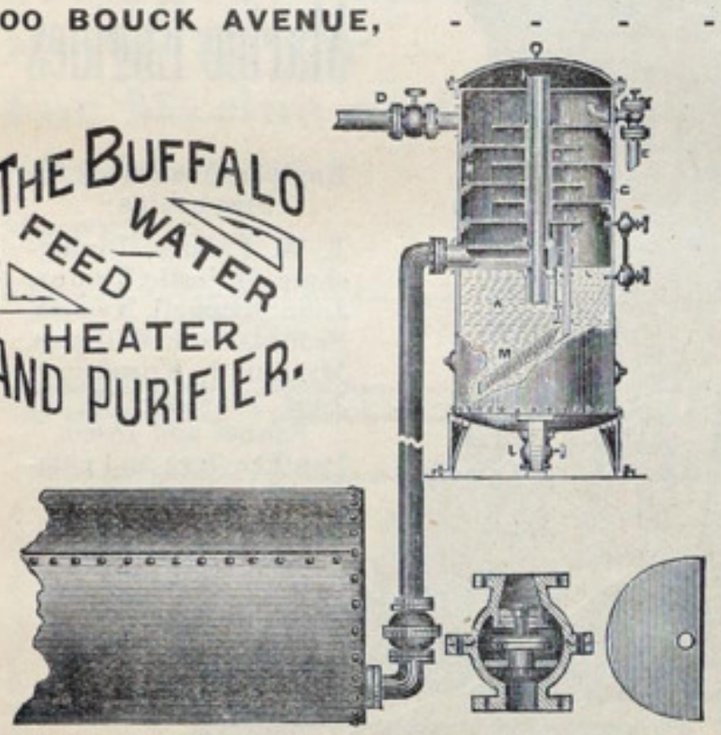

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B.—Boiler.
C.—Feed pipe to boiler.
D.—Steam pipe.
E.—Water supply pipe.
F.—Check valve.
G.—Spray disks.
H.—Spray chamber.
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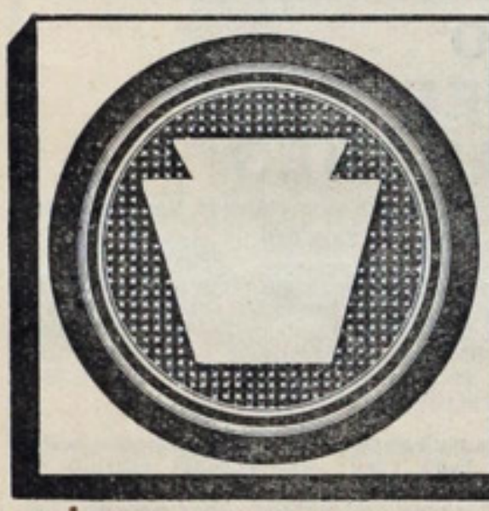

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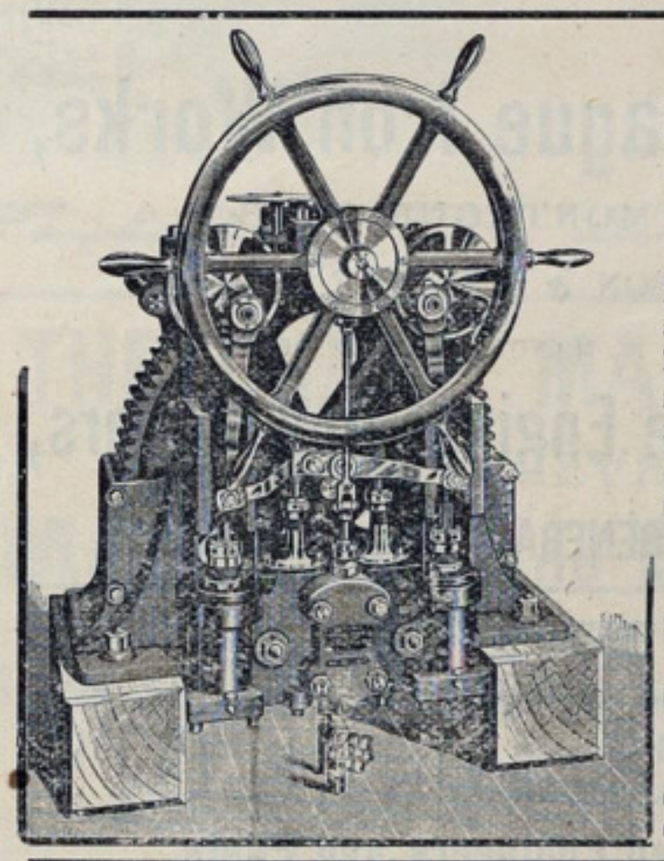

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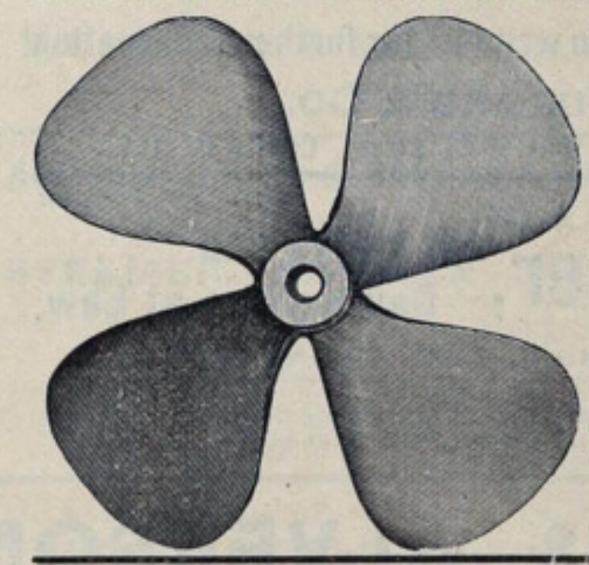

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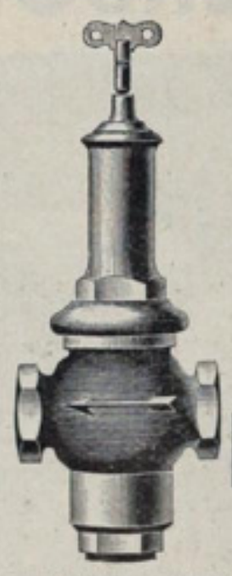

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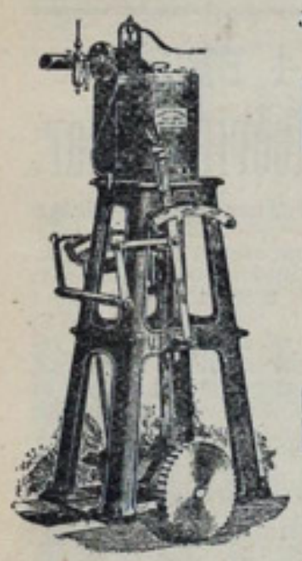

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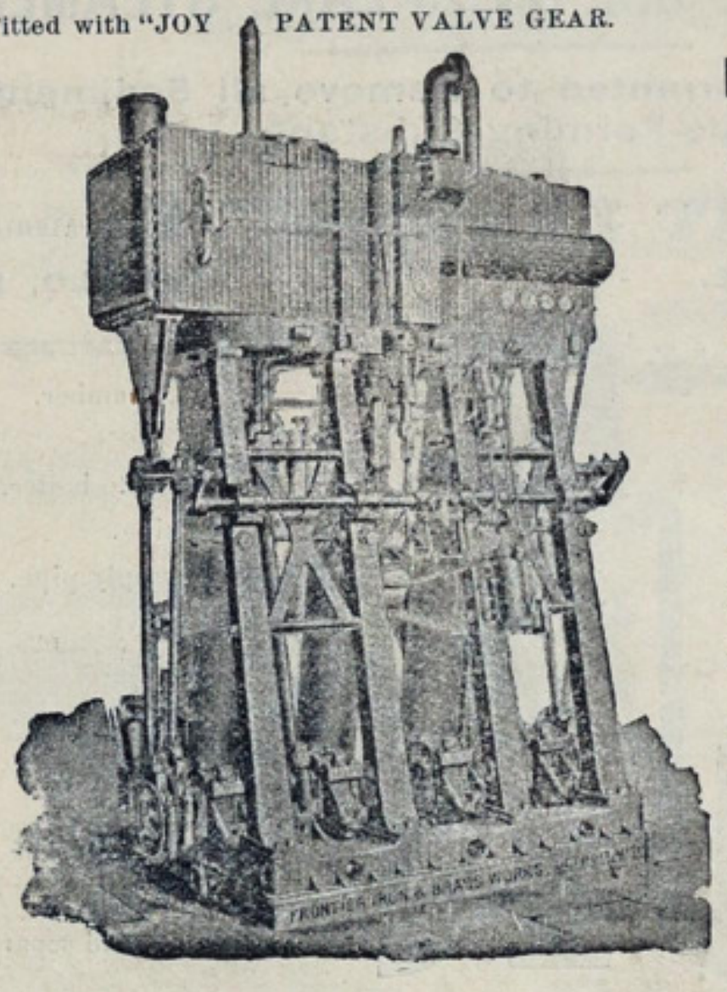

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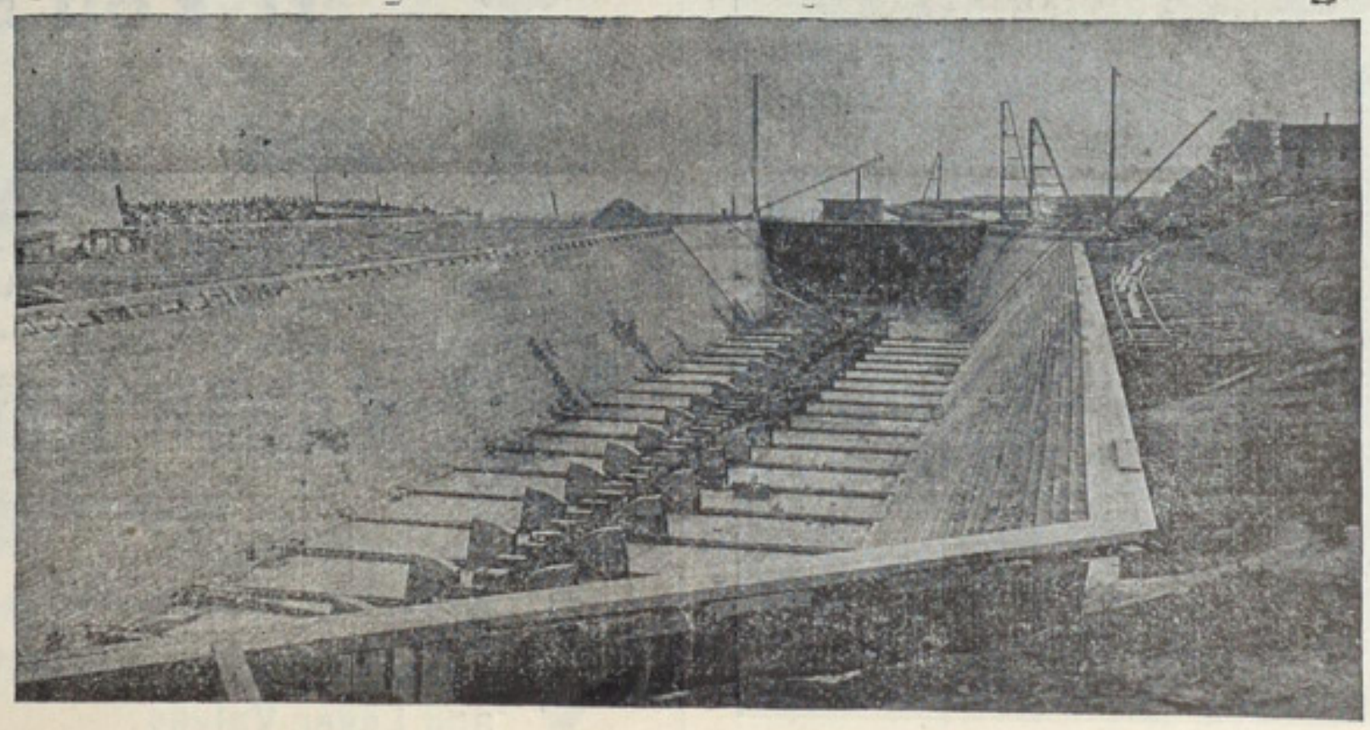

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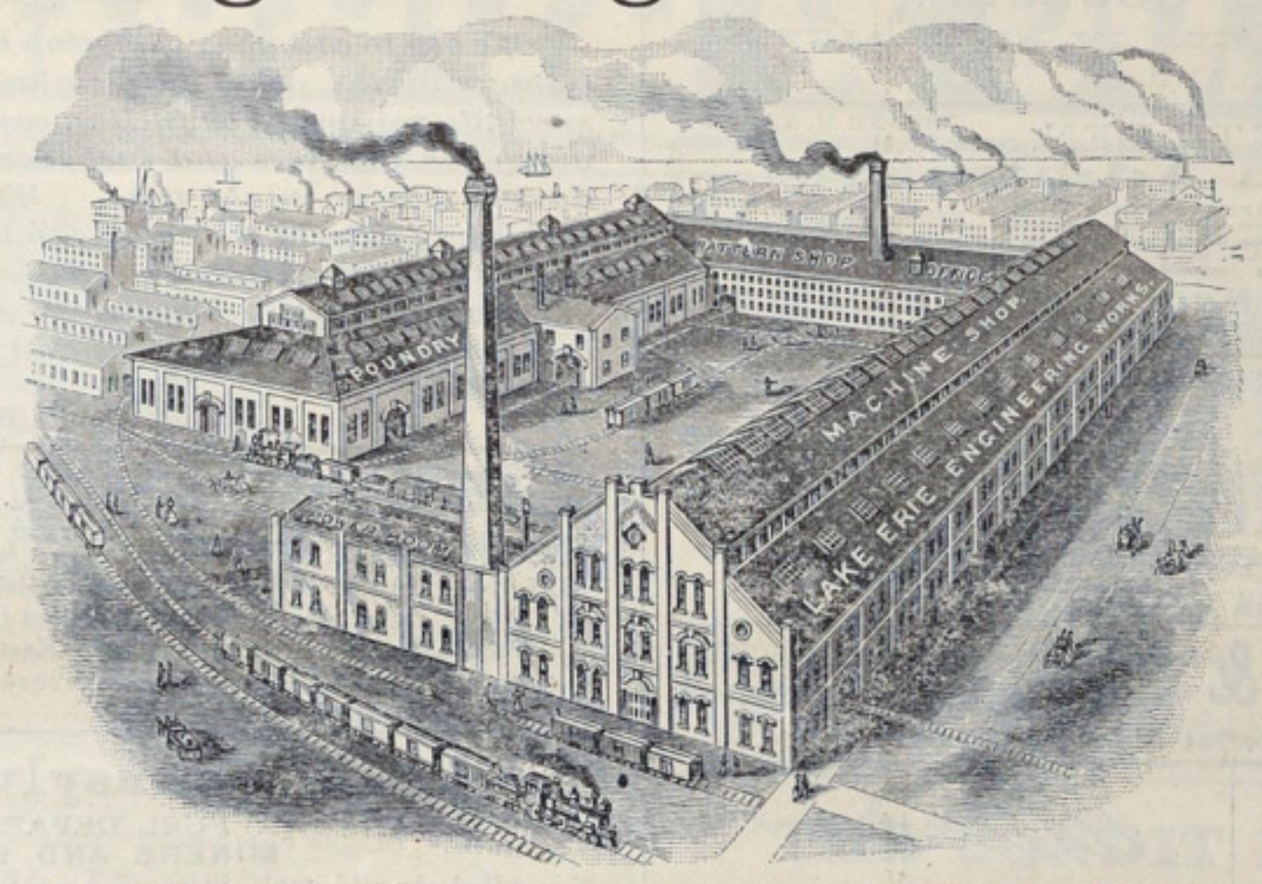


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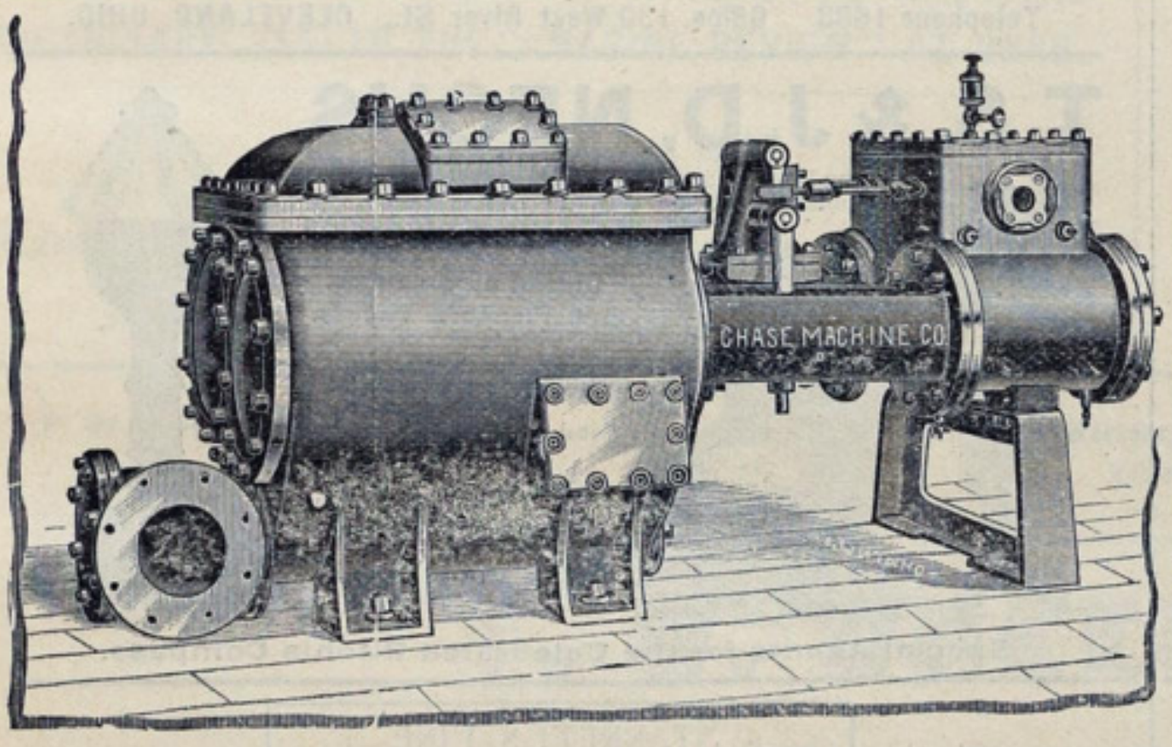


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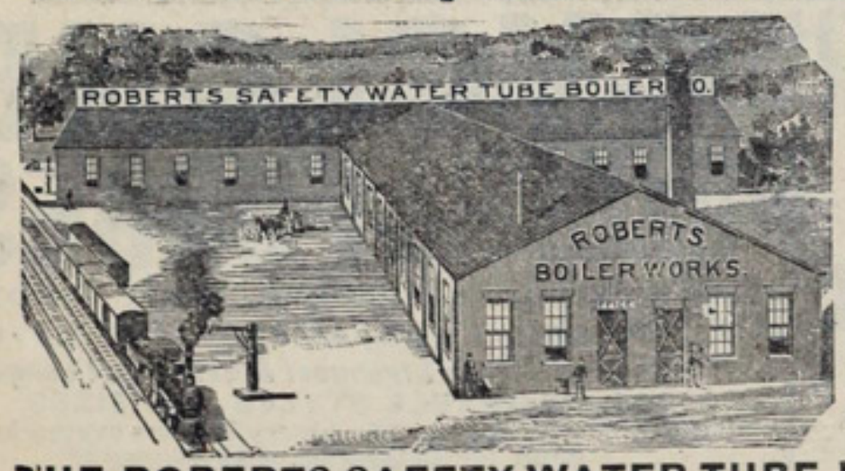


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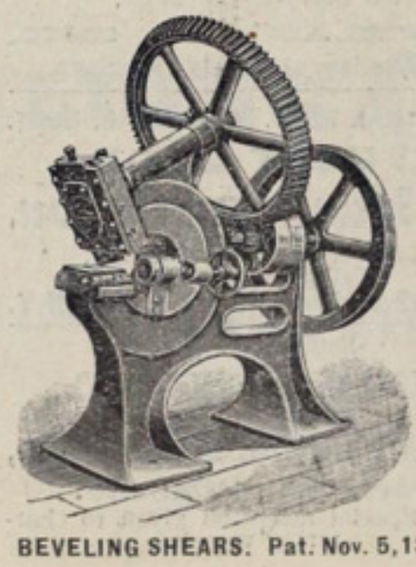

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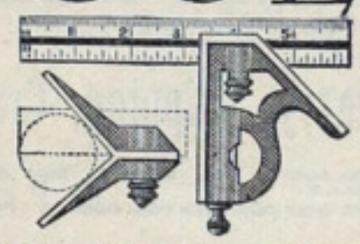

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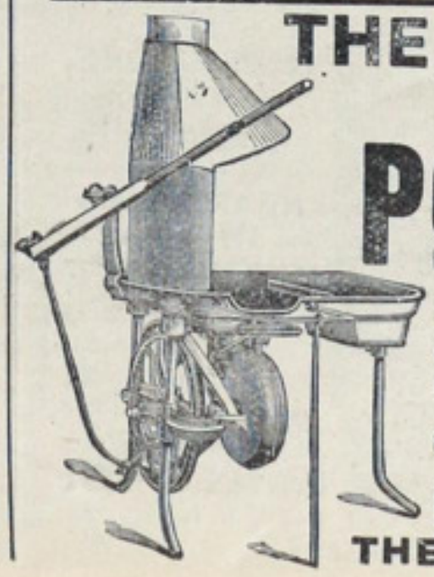

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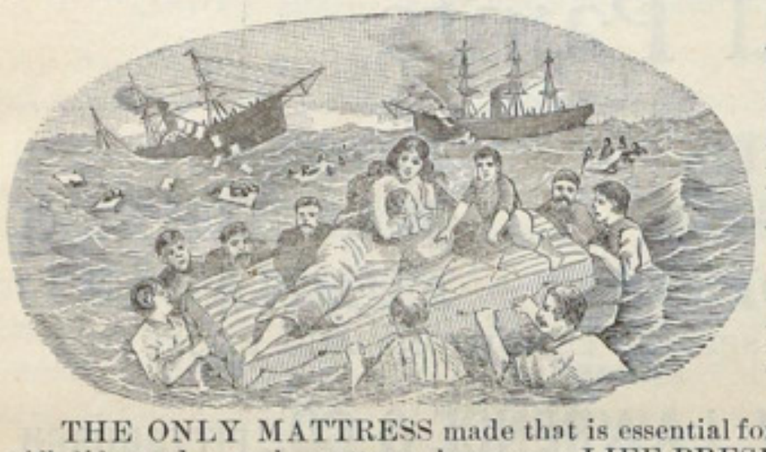

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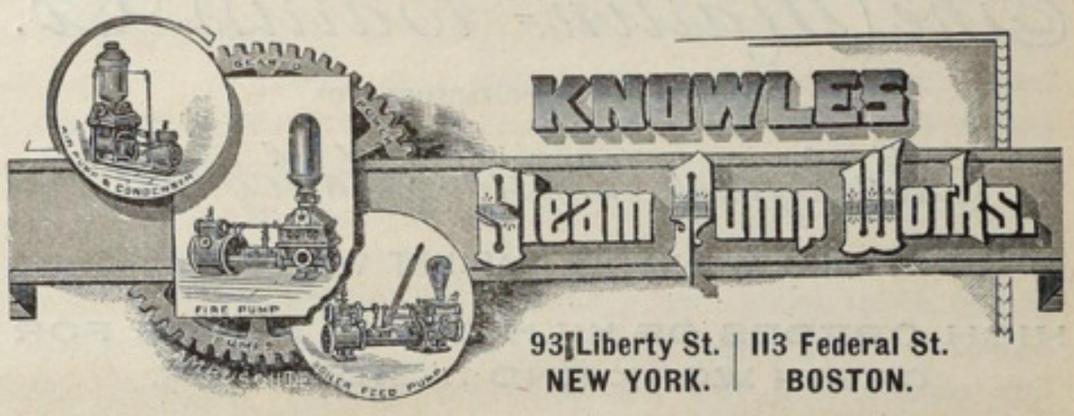

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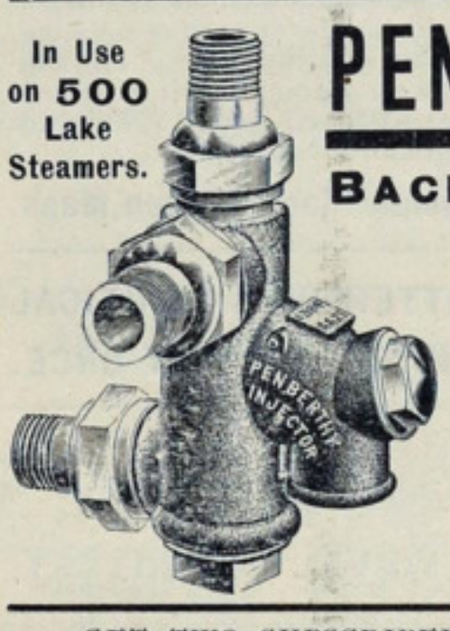


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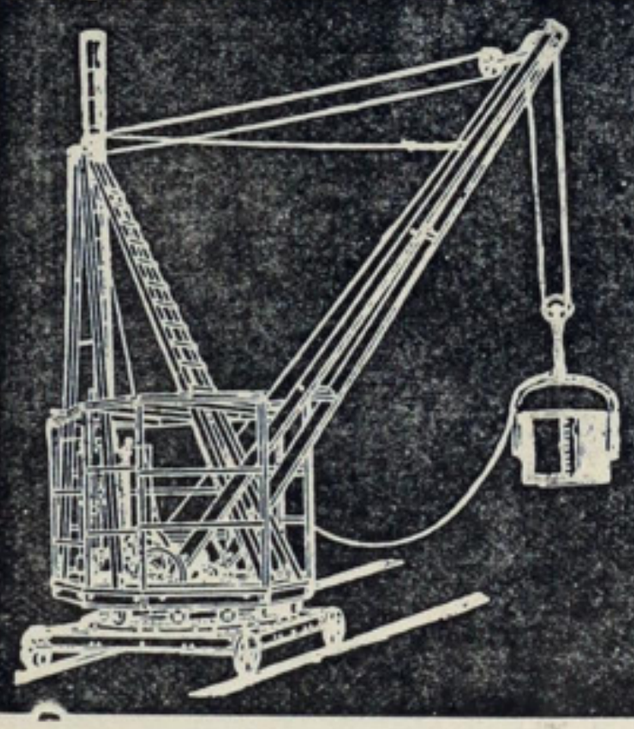

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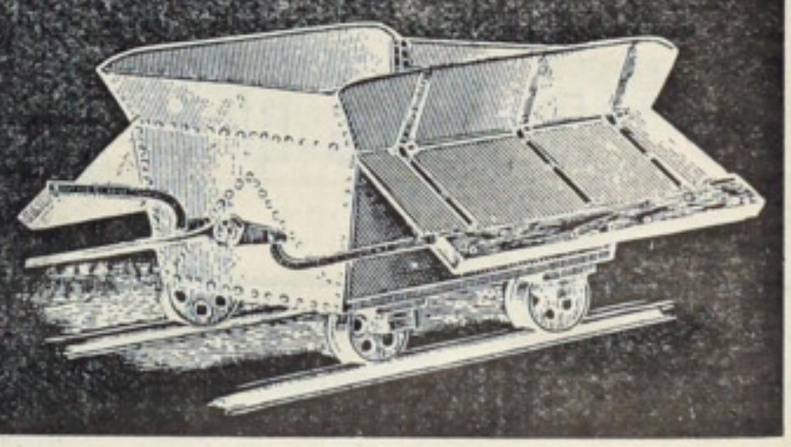

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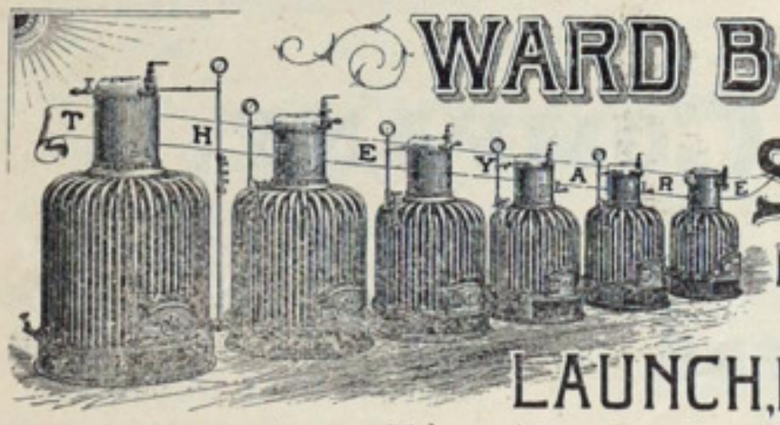


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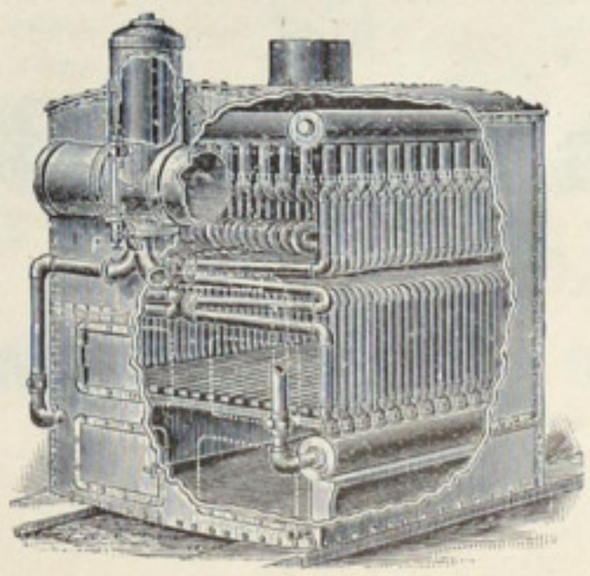

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